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OF THE

AMERICAN OTOLOGICAL SOCIETY.

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TRANSACTIONS

OF THE

AMERICAN OTOLOGICAL SOCIETY,

TWENTIETH ANNUAL MEETING.

Pequot House, New London, Conn., July 19, 1887.

VOL. 4, PART 1.

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American Otological Society.

The Twentieth Annual Meeting of the American Otological Society was held at the Pequot House, New London, Conn., on Tuesday, July 19th, 1887, at 10.30 A. M., the President, Dr. J. S. Prout, of Brooklyn, N. Y., in the chair.

The following members were present:

Drs. C. R. Agnew	New York, N. Y.
J. A. Andrews	New York, N. Y.
Gorham Bacon	New York, N. Y.
E. W. Bartlett	Milwaukee, Wis.
C. H. Burnett	Philadelphia, Pa.
F. P. Capron	Providence, R. I.
W. H. Carmalt	New Haven, Conn.
B. E. Fryer	Kansas City, Mo.
J. Green	St. Louis, Mo.
Emil Gruening	New York, N. Y.
E. E. Holt	Portland, Me.
Lucien Howe	Buffalo, N. Y.
H. Knapp	New York, N. Y.
J. A. Lippincott	Pittsburg, Pa.
A. Mathewson	Brooklyn, N. Y.
C. S. Merrill	Albany, N. Y.
H. G. Miller	Providence, R. I.
H. L. Morse	Boston, Mass.
H. D. Noyes	New York, N. Y.
J. S. Prout	Brooklyn, N. Y.
D. B. St. John Roosa	New York, N. Y.

W. W. Seely . . . . . Cincinnati, O.
S. Sexton . . . . . New York, N. Y.
T. Y. Sutphen . . . . . Newark, N. J.
Samuel Theobald . . . . . Baltimore, Md.

And by invitation:

Drs. Rhodes . . . . . U. S. Navy.
C. J. Colles . . . . . New York, N. Y.
B. Alexander Randall . . . . . Philadelphia, Pa.
Henry F. Norris . . . . . .
F. M. Wilson . . . . . Bridgeport, Conn.
D. N. Skinner . . . . . Auburn, Me.
Mr. J. A. Maloney . . . . . Washington, D. C.

Dr. E. E. Holt was appointed as Secretary *pro tem.*

The President alluded to the loss by death, since the last meeting, of two members of the Society, Dr. Ezra Dyer, of Newport, R. I., and Dr. William S. Little, of Philadelphia, Pa.

Dr. C. R. Agnew offered the following preamble and resolution, which was unanimously adopted:

Whereas, Our esteemed colleague, Dr. J. J. B. Vermyne, so long the faithful Secretary of this Society, is prevented by sickness from being in his accustomed place among us, therefore

Resolved, That the Secretary of this meeting be and hereby is instructed to send him our affectionate greetings, with assurance of our regret for the cause of his absence, with expressions of our sincere sympathy and fraternal desire that he may speedily be restored to health.

The President appointed as the Business Committee Drs. J. Green, J. A. Andrews and J. A. Lippincott.

The Treasurer's report was read and referred to Dr. H. G. Miller, as Auditing Committee.

Dr. C. H. Burnett was appointed a member of the Committee on Membership, in place of Dr. W. S. Little, deceased.

The Auditing Committee stated the report of the Treasurer to be correct and the accounts properly vouched for. The Treasurer's report was then accepted.

The Committee appointed to take into consideration the communication of Dr. Mastin and others, upon the subject of a Congress of American Physicians and Surgeons, made a report through the Chairman, Dr. C. R. Agnew. The report was accepted and the following resolutions adopted:

Resolved, That this Society hereby expresses its acquiescence in the general plan for the formation of a Congress of Special Societies, as set forth in the printed minutes of the Washington Conference of September 24, 1886;

Resolved, That the report of the Committee appointed to confer with representatives of Special Medical Societies in regard to the formation of a Congress of said Societies be, and hereby is adopted;

Resolved, That C. R. Agnew (for alternate W. H. Carmalt) be, and hereby is designated and authorized to represent this Society in the meeting, which is proposed to be held in the Autumn of 1887, to prepare and carry into effect a plan for the first meeting of said Congress in 1888.

1. Dr. H. Knapp, of New York, N. Y., Chairman of the Committee on "The Examination of the Power of Hearing and How to Record its Results", made a report, which was discussed by Drs. Sexton, D. B. St. John Roosa and Theobald. On motion it was voted that the report be adopted and the Committee discharged with the thanks of the Society.

2. Dr. C. H. Burnett, of Philadelphia, Pa., read a paper on "The Successful Removal of an Exostosis from the Auditory Meatus by Means of Bone Forceps and Chisel". It was discussed by Drs. Knapp, Andrews and Agnew.

3. The next paper was by Dr. D. B. St John Roosa, of New York, N.Y. "Cases Illustrating the Differential Diagnosis between Affections of the Middle Ear and those of the Labyrinth."

Discussed by Drs. Knapp, Morse, Gruening, Sexton, Holt, Seely, Capron and Sutphen.

4. Dr. Roosa read "Remarks upon a Case of Cerebral Abscess"; also a paper entitled:

5. "Suppuration of the Tympanum, Occurring in a Patient with Bright's Disease."

Discussed by Drs. Carmalt, Burnett, Gruening, Sexton, Fryer, Andrews, Howe, and Sutphen.

6. Dr. E. E. Holt, of Portland, Me., presented an "Efficient Powder Blower, with Remarks upon the Use of Powders in the Treatment of Diseases of the Ear".

7. Dr. Samuel Theobald, of Baltimore, Md., presented a Powder Blower with Remarks upon its Use.

Discussed by Drs. Seely, Prout, Roosa, Sutphen, Randall, Knapp, Agnew.

Adjourned to 3.30 P. M.

Afternoon Session.

The President called the meeting to order at 3.30 P. M.

The minutes of the morning session were read and approved.

Dr. Roosa exhibited the specimen relative to his case of "Suppuration of the Tympanum Occurring in a Patient with Bright's Disease".

Dr. Knapp made further remarks upon the use of Boric Acid in Suppurative Inflammation of the Ear, and the discussion was continued by Drs. Gruening, Roosa, Agnew, Howe, Sexton, Prout, Seely, Theobald, Burnett and Lippincott.

8. Dr. C. H. Burnett, of Philadelphia, Pa., read his paper: "An Examination of Fifteen Deaf-Mutes by means of J. A. Maloney's Otophone"; also by title:

9. A paper on the same subject, by Dr. F. B. Loring, of Washington, D. C., which was referred to the Committee on Publications. The otophone was exhibited.

It was discussed by Drs. Seely, Burnett, Prout, Knapp, Capron, Carmalt and Sutphen.

10. Dr. H. L. Morse, of Boston, Mass., exhibited

"Photographic Illustrations of the Anatomy of the Human Ear".

Dr. B. Alexander Randall, of Philadelphia, Pa., made remarks upon the subject.

11. Dr. S. Sexton, of New York, N. Y., read a paper on "Excision of the Ossicles of the Drum of the Ear".

Discussed by Drs. Knapp, Gruening, Theobald and Burnett.

On recommendation of the Committee on Membership, the following gentlemen were elected to membership by ballot:

Drs. C. J. Lundy	of Detroit, Mich.
W. H. Hotchkiss	of New Haven, Conn.
S. D. Risley	of Philadelphia, Pa.
David de Beck	of Cincinnati, O.

Adjourned to meet at 9 o'clock P. M.

Evening Session.

The President called the Society to order at 9 P. M. The minutes of the afternoon session were read and approved.

12. Dr. Samuel Theobald of Baltimore, Md., read his paper: "A case of Syphilitic Disease of the Labyrinth, Exhibiting Remarkable Variations in the Degrees of Deafness".

Discussed by Drs. Gruening, H. D. Noyes, Agnew and Seely.

On account of the absence of the authors the following papers were read by title and referred to the Committee on Publications.

13. Dr. A. H. Buck, of New York, N. Y. "A Case of Rapid and Almost Total Loss of Hearing, in a Child Seven Years of Age; Inherited Syphilis Apparently the

Cause; Marked Improvement Following the Use of the Iodide of Potassium."

14. Dr. O. D. Pomeroy, of New York, N. Y. "Desquamative Inflammation of the Middle Ear with Remarks."

The Business Committee reported the following list of officers for the ensuing year:

President: . . . . . Dr. J. S. Prout, of Brooklyn, N. Y.
Vice President: . . . . . Dr. Geo. C. Harlan, of Philadelphia, Pa.
Secretary and Treasurer: . Dr. J. J. B. Vermyne, of New Bedford, Mass.
Committee on Membership: Dr. Gorham Bacon, of New York, N. Y.; Dr. D. B. St. John Roosa, of New York, N. Y.; Dr. J. Orne Green, of Boston, Mass.
Committee on Publications: Dr. J. J. B. Vermyne, of New Bedford, Mass.; Dr. C. J. Blake, of Boston, Mass.; Dr. J. Orne Green, of Boston, Mass.
Member of Committee on Organization of a Congress of Special Societies: . . . Dr. C. R. Agnew, of New York, N. Y.
Alternate: . . . . . Dr. W. H. Carmalt, of New Haven, Conn.

These officers were duly elected by ballot.

The Business Committee further recommended that this Society hold its next Annual Meeting the day before the meeting of the American Ophthalmological Society and at the same place. Adopted.

On motion it was voted to accept the offer, made by Dr. Gorham Bacon, of continuing the Alphabetical Index compiled by himself and Dr. F. L. Jack, of Boston, Mass., in the Transactions for the current year.

On motion the Society passed a vote of thanks to their presiding officer, and after reading the records of the evening session adjourned at 10.30 P. M.

E. E. HOLT, *Secretary pro tem.*

A true copy, attest.

J. J. B. VERMYNE, *Secretary.*

THE EXAMINATION OF THE POWER OF HEARING, AND HOW TO RECORD ITS RESULTS.

Committee Report by Dr. H. Knapp (Chairman), Dr. J. S. Prout and Dr. D. B. St. John Roosa.

At our meeting in 1885, the chairman of your committee was instructed to recommend at the Section of Otology in the German Society of Physicians and Naturalists at Strasburg, a more general adoption of the mode of designating the different degrees of impairment of hearing as fractions of the normal standard, a mode almost universally used in this country. Furthermore, on motion of Dr. J. O. Green, Drs. Knapp, Roosa and Prout were appointed a committee *on a Uniform Measure for Testing Hearing*, to report in 1886. Last year, owing to the absence of Dr. Roosa, the committee was continued for one year. We are now ready to report.

We thought it desirable to subject to a new consideration and revision, not only the tests by the watch and voice, but also such others as might yield reliable results in the hands of the aural practitioner.

Your committee are convinced that this is the case with the tuning-fork test, which, added to the tests by the watch and voice, will enable us to make a satisfactory examination of the function of hearing.

The propositions of the chairman of your committee received consent and opposition at Strasburg, and the otological section resolved to put the subject on the bulletin of its next meeting at Berlin, in September, 1886. Though this has not been formally done, a great deal of interest

was taken in the matter, and we shall endeavor to lay before you what we consider of importance in the recent incident literature.

I. WATCH AND POLITZER'S ACOUMETER.

Much as has been said against the watch, it is the handiest acoumeter we possess. A low-ticking watch will give us the great advantage of indicating the slightest degree of impairment of hearing, when the patient has not yet become aware of any defect, but comes to the physician on account of tinnitus or unusual sensations in his ears. If we want to ascertain such low degrees of impairment of hearing with a loud-ticking watch, or Politzer's acoumeter, we have to travel over from ten to forty feet of space, a very inconvenient procedure. When Dr. Knapp in Strasburg said that one of the great objections to the general use of Politzer's acoumeter was the fact that to determine normal hearing, he had to remove 45′ from his patient, Dr. Burkhardt-Merian replied that this disadvantage did not manifest itself in his practice, for his patients were all so hard of hearing that he was not obliged to remove far from them. Dr. Knapp asked if every now and then he did not cure a patient?

Indispensable as a low-ticking watch is, it is nevertheless insufficient. It does not measure higher degrees of deafness either by air conduction or bone conduction. In this case a loud-ticking watch or Politzer's acoumeter must supply the want. The truth of these remarks could, of course, not be ignored by so sharp an observer and so impartial a judge as Politzer himself. He acknowledges this in his text-book (Part I., p. 202, below, German edition) in words to this effect: A weak-ticking watch and a strong-sounding acoumeter are both indispensable. If the watch is heard, the acoumeter is superfluous; if the watch is not

heard, the acoumeter may still be heard and indicate degrees of deafness, that lie beyond the range of the ordinary watch. "For practical purposes it is to be recommended to use a low-ticking watch besides my acoumeter." Your committee are of the same opinion, and recommend the use of either or both, as the case may be. An essential qualitative difference between the two instruments we cannot recognize and think that their relation to each other is like that of whispering voice to loud speech. Though there is a certain uniformity in the different specimens of Politzer's acoumeter, yet they, like watches, have to be examined individually, and each aurist must do this in his consultation room. The hearing distance for Politzer's acoumeters varies from 25 to 55 feet; it is, at an average, $48' = 15m$.

As to the manner of *recording the hearing acuteness*, we have nothing to add to what is known and generally used in this country, namely:

$h = \frac{24}{24}''$, watch of 24″ hearing distance, heard at 24″.

$h = \frac{c}{24}$, on contact with the ear.

$h = \frac{p}{24}$, pressed against the ear.

$h = \frac{m}{24}$, applied to the mastoid.

$h = \frac{t}{24}$, $\frac{v}{24}$, $\frac{d}{24}$, $\frac{mb}{24}$, heard when applied to temple, vertex, teeth (dentes), everywhere on the skull (ubique).

$h\frac{c}{24} = 0$, not heard from ear.

$h\frac{m}{24} = 0$, not heard from mastoid.

$h\frac{ub}{24} = 0$, heard nowhere by bone conduction.

The same designations will hold for the acoumeter. Pol. ac. $= \frac{12}{8}'$. Politzer's acoumeter, which should be heard at a distance of 48′, is heard at 12′.

In *testing bone conduction with the watch* the ear should be held closed. A low-ticking watch, as a rule, will not be heard by patients over 50 years of age from mastoid, temple or any other part of the body when the ear is closed, but very distinctly from mastoid and temple when the ear is open. Politzer's acoumeter is heard both ways.

II. VOICE.

The human voice is generally acknowledged to be the most important test of hearing. It is used everywhere, and we beg to offer only a few remarks. As to intensity of voice we distinguish whispering, ordinary (conversational) and loud voice. These words do not express definite degrees of loudness, expressed mathematically in a general way. Each observer must determine by examining a number of persons who hear well, how far his whisper and his ordinary speech are not only heard, but clearly understood and correctly repeated. The standard, as in testing vision, should be the hearing acuteness of persons in middle life, from 20 to 48 years, not that of children, nor that of old people. In other words the determination, being entirely individual or personal, should practically be so done, that the aurist learns to whisper in his consulting room a variety of words or sentences so loud or so low as to be clearly understood by persons with healthy ears. This gives his personal standard. Say, for instance, his whisper is so modulated and toned down that it is readily understood, not guessed, at a distance of 20′, then he can express normal hearing for his whispered voice by $v = \frac{20}{20}$. That we can whisper so loud as to be understood at much greater distances, or so low that we must be near the listener's ear, is a matter of course. What does it mean, then, when Wolf, Chimani and Hartmann are quoted in many publications as having found that the average audibility of whispering voice varies from 60′ to 75′? The examinations of these gentlemen can only have been done in quiet, empty places, by raised voice and strained attention. Suppose a conversation be carried on in ordinary voice, not whispering, at a dinner table from 60′ to 75′ feet in length. How many hearing organs would come up to that standard? A toaster must speak loud and enunciate dis-

tinctly to be understood from one end of the table to the other, even when the least noise is carefully suppressed. If our esteemed colleague, Bezold, in a closed hall whispers to school children numbers which they expect, he may be understood at a distance of 60′, and if he does it in a like manner always, his manner of examination, though stilted and unusual, will furnish correct results. If we accept this as *his* standard, let him concede that reliable results may be obtained also by other people, in other localities, with other voices, using words and sentences for which the listener is not prepared and in the understanding of which the mind's ear does not help. All these determinations are personal, for which we do not claim more credit than can be accorded to the subjective estimation of a man who may be considered an expert. Even if he invariably either overrates or underestimates the hearing distance of his whisper, he would be able to judge correctly of the gain or loss of hearing power during the progress of a case, and we, reading his report, could form a much more definite idea of the changes in the auditory power of his patient than if he simply said: Whispering heard at 10*m*, 20*m*, and the like.

Bezold states that he has found the hearing distance of his whispering very nearly the same as that of Politzer's acoumeter, and therefore he thinks that he can, without appreciable inaccuracy, dispense with the watch and acoumeter. This may be correct enough for children whose hearing power is more or less normal, but, as is well known, the degrees of hardness of hearing ascertained by testing with the watch or acoumeter differ widely, and frequently even in a contrary sense, from those obtained by testing with the voice. What about a case where the hearing of the voice shows no impairment and the acoumeter is not applicable because a space of 50′ or 60′ in length is not at our disposal, but where a low-ticking watch

will mark $\frac{5}{24''}$? Such cases are numerous, not that they frequently come to us with one perfect ear, and the other only thus little affected, but they come with one bad ear, and the other ear, which they consider "all right", showing this slight, but decided, diminution of hearing. The opinion of your committee is that we want both tests, the watch-acoumeter as well as the voice.

The mode of recording the results of the voice test is as follows:

$v=\frac{20}{20'}$, or $=\frac{1}{20'}$, or $\frac{36}{20'}$ (over normal), etc.

$v=\frac{60}{60'}$, ordinary conversational voice understood at 60′, as it should be.

$v=\frac{5}{60'}$, etc.

$v=\frac{60'}{\infty}$, quantitative perception of speech, *i. e.*, a voice which should be understood at a distance of 60′ is heard, but not understood, however near to the ear.

$v=\frac{0}{60'}$ voice not heard at all.

Before leaving the subject of tests by the watch, acoumeter and voice, your committee may bring to your recollection, that the state of the room in which they are made, as to noise or quietude, should always be considered. A person suffering from disease of the middle ear may hear in a noise the voice at a surprising distance, as compared with that at which he hears it when all is quiet. The reverse is true as to persons affected with disease of the nerve.

The results obtained by tests in noisy clinics or in very quiet chambers are illusory, unless the conditions under which they are made are noted.

III. TUNING-FORKS.

For the *healthy ear* the following propositions are generally accepted:

1. All tuning-forks, from all parts of the skull, are

heard louder and longer when the ear is closed than when it is open. (E. H. Weber.)

2. All tuning-forks are heard longer by air conduction than by bone conduction. (Rinne.)

3. Low tuning-forks (for instance A=110 double vibrations) are heard louder, but not longer, by bone conduction than by air conduction, whereas higher tuning-forks (c^1=264 vibr.) are heard louder by air conduction. (J. B. Emerson.)

Departure from these conditions indicates disease. The tests by tuning-forks, more especially that of Rinne, are most valuable in the diagnosis, prognosis and treatment of a majority of ear diseases. They should, in every case of impairment of hearing, be used as regularly as the watch and voice tests. It is not our object here to discuss their diagnostic importance, but only their manner of employment. The two following sentences may, however, be granted as an introduction.

Weber's test compares the hearing of one ear with that of the other, and with the hearing of a normal ear, by bone conduction only.

Rinne's test compares air conduction with bone conduction and is most valuable in the differential diagnosis between disease of the middle and the inner ear. Rinne's test has been much modified, but the principle remains the same.

It can be used in three ways:

1. The duration of the air conduction and the duration of the bone conduction are compared with the normal standard. *Example:* Tuning-fork c^2 (512 double vibrations) is struck with moderate force and held before the ear; the time from that moment until its tone is no longer perceived is measured with a second-watch, and found 60 seconds. Then the tuning-fork is struck anew with the same force and immediately placed on the mastoid. It is heard

30 seconds. If we examine in this way a number of normal ears, we soon will be surprised how similar the results are and from the average value of sufficiently numerous observations we can determine the normal standard. A comparison of the hearing of a patient with this value will express the relation of his hearing to the normal standard. *Example:* He hears the fork only 10 seconds when held before the ear. We then say:

$Fc^2AC = \frac{10}{60}$, *i. e.*, the patient's air conduction for the tuning-fork c^2 is $\frac{10}{60}$ of the normal standard. His bone conduction tested in the same way is found:

$Fc^2BC = \frac{45}{30}$, *i. e.*, 15 seconds more than the normal. This condition is similar to that of the normal ear when it is stopped up, the tuning-fork is then heard shorter by air, and longer by bone conduction. We may therefore conclude that our patient's sound conducting apparatus is clogged.

2. We determine the patient's air conduction and bone conduction in the above manner and compare the results with each other. *Example:* If we find the air conduction as above = 10", the bone conduction 45", the relation of one to the other would be expressed:

$\frac{Fc^2\,AC}{Fc^2\,BC} = \frac{10}{45}$.

Or, $Fc^2AC : BC = 10 : 45$.

3. We measure, as Rinne did, the excess of air conduction over bone conduction, or *vice versa*, without striking the fork anew, and call the result positive (+) if, as in the normal, the air conduction exceeds the bone conduction in duration: we call it negative (—) when the opposite occurs. *Example:* The c^2 fork struck with moderate force and placed on the mastoid ceases to be perceived in 20 seconds, then when held immediately before the ear, it is heard 40 seconds longer. According to general custom this is expressed as follows:

Rinne $Fc^2 + 40$. When we find that in a patient the condition is reversed, that the fork when no longer heard

through air is heard again when placed on the mastoid, say for ten seconds longer, we express it:

Rinne $Fc^2 = -10$.

The first condition corresponds to the normal, the latter indicates obstruction of the sound conducting apparatus. It also can be imitated by an experiment on the healthy ear: Stop the ear up with the finger, hold a vibrating tuning-fork in front, and, as soon as you lose its sound, place it on the mastoid; you will hear the sound again for a certain time which you measure with the second-watch. We find about 15 seconds, which expressed by the above formula would be:

Rinne $Fc^2 = -15$ sec.

This mode of recording the results of Rinne's experiment does not indicate the normal standard, and therefore fails to convey a precise idea of the location and degree of the defects. As the fork is heard a certain time by bone conduction and a certain time by air conduction additionally, both ought to be recorded. The formulas thus obtained will present a clear idea of the diagnostic significance of Rinne's experiment.

Examples:

Rinne $Fv^2 B\frac{2}{20} + A\frac{4}{40}$, normal condition;

" $Fc^2 B\frac{1}{20} + A\frac{4}{40}$, BC diminished, AC normal;

" " $B\frac{0}{20} + A\frac{4}{40}$, " abolished, " normal;

" " $B\frac{2}{20} + A\frac{1}{40}$, " normal, " diminished;

" " $A\frac{0}{40} + B\frac{3}{20}$, AC abolished, BC increased;

" " $B\frac{5}{20} + A\frac{1}{40}$, BC and AC diminished;

" " $B\frac{0}{20} + A\frac{0}{40}$, both BC and AC abolished.

All these and similar variations are found in nature, and indicate the conditions of the sound conducting and sound perceiving parts, either singly or combinedly, as well as their relative quota. The clearer the formula, the easier the interpretation. It is important to put B first and A last when bone conduction is tested first and air conduc-

tion afterwards, and *vice versa*. This will show the deviation from the normal in either, and at the same time how much one exceeds the other. If we begin with examining the bone conduction, and then find that AC is 0, we have to repeat the experiment in a reverse order. We may then find that AC is not abolished, though below the audibility of a tuning-fork which has been vibrating on the mastoid until it could no longer be perceived. We are aware that the above values are only approximative. If the first term in the above expressions deviates from the normal, a correction should be introduced in the second. Further study is required to formulate this correction.

Rinne's method, gentlemen, is the most expeditious and practically the most important. It should be employed in a routine way, just as the watch and voice tests, in every case where impairment of hearing comes into question at all.

In ordinary clinical work the tuning-fork may be struck anew for the test by air and bone.

We recommend to you for adoption the above methods of examining the hearing power and recording its results, as a uniform measure of testing hearing. If used as proposed they will give a sufficient and clear picture of the functional disturbance in a patient's hearing organ, without consuming too much time.

In cases of special interest the method of examination may be extended, more especially tuning-forks of different pitch (low, A 110 vibs., middle $c^2=512$, and high c^3 or c^4), Galton's whistle and König's steel rods (for instance, the one $g^6=12{,}228$ vibrations) may be used.

As to the mode of recording, we have remained by the one in general use in this country and we have tried to extend it to the tuning-fork tests. A. Hartmann, of Berlin, has of late adopted the same principle with this difference, that, instead of using the common fractions which, unre-

duced, indicate the way in which the values are obtained, he computes the per centum amounts of hearing which the patient possesses, and enters them as determined with four tuning-forks of different pitch, in a blank which in this way presents a graphic picture of a patient's hearing. According to the results obtained from a great number of examinations, he sets up from four to seven different types of impairment of hearing. He says, however, that the examinations according to his paradigm consume so much time that they can have only a limited application.

Lucae compares the patient's perception of tuning-forks with his own. When a patient ceases to hear the tuning-fork from his mastoid, Lucae immediately places the fork on his own mastoid, and counts how many seconds longer he hears it. He thus compares defective BC with normal BC.

It has been objected to Hartmann and our methods of designating the hearing power that the fractional values were not correct; sound decreasing with the square of the distance, our fractions should not, as they do, progress arithmetically, but geometrically; *i. e.*, the values should not be proportional directly to the distances, but to the square roots of the distances. The same objection has been raised against the generally adopted method of proportioning the diminutions of the acuteness of vision directly to the distances of the test objects, instead of to the square roots of the distances. For instance, if No. 40 is not seen at 40 feet, but only at 20′, *i.* is not $\frac{20}{40}=\frac{1}{2}$, but $(\frac{1}{2})^2=\frac{1}{4}$. Visual acuteness is indeed proportionate to the smallest squares, not the smallest lines, a patient can discern. In spite of this, the correction has not been made. Ophthalmologists prefer the simpler mode, they know what is meant and that is enough. In the same manner, microscopists do not measure the magnifying power of their lenses by squares or other surfaces, but by linear dimensions. We need, there-

fore, have no scientific scruples in abiding by the simple fractions.

If the above propositions form a step of advance in the right direction and seem acceptable to the society our reports of cases will gain both in conciseness and precision. Your committee need not say that they consider their propositions open to simplification, emendation and extension.

DISCUSSION.

Dr. Sexton:—I suppose that we have all been much interested in this paper in which some of the difficulties met with in testing the hearing have been referred to. There can be very little added in that direction, but in listening to the paper it seemed to me that perhaps sufficient importance had not been given to the varying conditions of the patients themselves. We find in many cases of chronic catarrhal inflammation of the middle ear with trophic changes, and also in certain acute forms of inflammation, that there are constantly varying changes in the tension of the transmitting mechanism of the drum of the ear. These are, in fact, the cases in which we are perhaps more interested in testing the hearing than in any others. In these cases, the hearing changes from day to day and even from hour to hour. The tests of the morning would not apply in the afternoon. I have noticed that some patients seen early in the morning, when the perceptive faculties are active, will hear better than later in the day. It is of course well known that the electrical and vapor tension of the air has something to do with the transmission of sound. The temperature also exerts an influence. On a damp day the hearing power is often quite different from what it is on a dry day. We all know that we can hear better on a cold day than on a warm day.

It seems to me, therefore, Mr. President, that we shall always have great difficulty in obtaining absolutely certain tests for the more interesting cases that come under observation. We may have them for normal hearing, but scarcely ever for very abnormal hearing.

Dr. Roosa:—The committee, in one portion of its report, introduced the point that has just been raised, not exactly in that manner, but the general point that in testing the hearing it was important to note the kind of room, or the kind of space in which the tests were made. I am not inclined to lay such stress upon the changes of the hearing from hour to hour in chronic diseases of the middle ear, as has just been indicated. I think that there are such variations just as there are in vision, with reference to the power of accommodation. In a case of chronic disease of the middle ear—a pure case of that kind—I think that the differences in hearing from hour to hour are not very great. I think that they are much more marked in diseases of the internal ear, but where muscular fatigue comes in, as it does in diseases of the middle ear, it may affect the tension of the drum head; and in cases of nervous deafness the condition of the nervous system, that is, nervous exhaustion, has much to do with the capacity for hearing.

What I rose to say, however, is this, that the committee attempted to lay stress upon these variations, and to call attention to the fact that stress enough had not been laid upon the kind of room and the conditions of the room in which the test is made. Many persons think that they hear better at a certain time, but exact testing shows that they hear better only when certain given conditions are present under which they always hear better. The variation is not so much in their ears, as in the conditions. It is impossible to have mathematical exactness in this matter. The human voice varies so excessively in its capacity in different individuals, that the notion of giving a definite

power to the whispered voice must be a mistake. Watches also vary much, even in their two notes. It is therefore utterly out of the question to have absolute exactness. After all, the results are about as exact as in ophthalmology. For instance, no one thinks that $\frac{20}{xx}$ or $\frac{20}{xL}$ is an exact method of expressing the visual power. This is, however, almost as exact as the thermometer in the expression of the temperature of the air.

The committee thought that this report, which was drawn up by Dr. Knapp, to whom the committee cheerfully give the credit for the valuable part of the work upon it, might possibly assist in formulating the hearing power, but always with the reservation that no formula, no system, can exactly measure the hearing power, any more than any system can actually measure, under varying conditions, the visual power.

Dr. Sexton: — I should like to add but one sentence, a remark that I forgot to bring up, and that is, that in examining patients they are liable to be fatigued by the examination and become indifferent to the tests, so that it is difficult to get their attention. In many instances, the patients become annoyed at repeated attempts to correct the observation.

In regard to the variations of hearing in certain cases and in the greater number of cases of chronic trouble where there is deafness, I may add that with every renewal of air in the tympanum, the tension of the drum is altered and the hearing varies. The patient will hear the ticking of a watch one minute and not another. It is impossible to expect accuracy in these cases.

Dr. Theobald: — As bearing upon the value of the tuning fork, I would mention an observation which I have made in a number of instances and which I have been unable to explain. It is by no means an uncommon experience with me, when testing with the tuning-fork, that when I place it

on the *vertex* it is heard louder, we will say, in the right ear. Then I will strike it again and place it on the *forehead*, and it will be heard louder in the left ear. This observation has given me less confidence in the tuning-fork as a differential test between middle ear and labyrinthine troubles than I before had. I do not know that I have seen attention called to this fact.

Dr. Knapp:—The remarks of Dr. Theobald as well as those of Dr. Sexton form one of the applications of the hearing tests. All of us will certainly agree that for practical purposes, we must test the hearing as accurately and with as little loss of time as possible. The variations to which Dr. Sexton has called attention afford us indications for prognosis and treatment. We all know that in cases of impairment of hearing from chronic catarrh, we are apt, by testing, to get no marked changes in the hearing power, and this may be so for weeks or months. In such cases, I feel warranted in telling the patient that it is a confirmed condition and that I can do nothing for him. Where, however, as a result of changes in the weather or changes in the patient's condition, there is a change in the hearing power as tested by these various means, there is something to improve. We get not only an estimation of the condition, but we also get a foundation for prognosis and an indication for treatment.

THE SUCCESSFUL REMOVAL OF AN EXOSTOSIS FROM THE EXTERNAL AUDITORY MEATUS BY MEANS OF BONE FORCEPS AND CHISEL.

By Charles H. Burnett, M. D., *Philadelphia, Pa.*

On April 29th, 1887, Dr. J. U. H., of Baltimore, Md., applied to me for relief from an exostosis in his right auditory canal, which had been growing there for fifteen years, and now interfered greatly with hearing. The growth was attached to the anterior wall of the right meatus, just within the edge of the tympanic bone. It was pedicellate, like a polypus, and a probe could be swept around the entire circumference, excepting at the point of attachment, which, however, could not be seen, but was felt by means of a ring-pointed probe. The exostosis was nearly a centimetre in diameter, covered on its outer surface with thick, insensible skin, and it closed, nearly hermetically, the external meatus. On May 4th, 1887, I proceeded to remove this obstruction, as follows: First, five minims of a 5% solution of hydrochlorate of cocaine were injected hypodermatically into the concha near the exostosis; the tumor and the adjacent parts, as well as the instruments, were mopped with a 5% solution of carbolic acid, and the outer surface of the bony tumor was seized with specially devised bone forceps, and a piece cut off. This caused very little pain, though the peculiar sense of concussion caused by the use of the forceps on the bone was disagreeable to the patient. Another hypodermic injection of cocaine was given, the parts incised were mopped with it and

also with a 5% solution of carbolic acid, and by the use of the forceps pieces were removed until nearly one-half of the tumor was excised. At first the bone was like ivory, but further inward it became more cancellous. After so much of the growth had been removed in this way, the rest could not be reached by the blades of the forceps, because of the narrowness of the canal. I then used a small chisel and a hammer to chip away the remnant. This was easily accomplished, because a few blows near the attachment, with this small instrument, which so easily entered the auditory canal, knocked off the entire remainder as a whole, and it was lifted from the canal with slender forceps.

The entire operation required one hour and twenty minutes, a longer time than I would require again, as I should not feel so much uncertainty as to the amount of force which could be applied to the tympanic bone without injury. I should aim at once for the point of attachment of a pedicellate growth, which in this case was equal to about one-eighth of the entire circumference of the tumor, and endeavor in a few blows with a chisel to cut through it, and then detach the entire mass. In the sessile form with broad base I would endeavor to remove the growth by chiseling or cutting off layers of the bone, beginning at the apex of the exostosis.

During the operation the cut parts were frequently mopped with a 5% solution of carbolic acid and a solution of cocaine of similar strength.

When the exostosis had been removed, the osseous canal and the membrana tympani were found free from discharge of any kind, but covered by a glove-finger cast of epithelium. This was removed by forceps. It was adherent at one point of the lower wall of the canal, from which a drop or two of blood flowed, when the cast was pulled out. In other respects the parts in the fundus, and the hearing, were normal.

The cut surface of the bony pedicle was dusted with iodoform, and the patient advised not to walk about in the sun. That evening the temperature was half a degree higher than normal. There was no febrile reaction. The next morning the cut bone surface was half covered in by new skin. In two days it was entirely covered over.

At the time of writing, the point of attachment looks like a small cushion of pink, soft skin, a millimetre above the general surface. Otherwise the ear is normal.

The case of Dr. L. B., of Hamburg, resembles this case somewhat in the fact that forceps and chisels, and not a dental lathe, were used to remove the exostosis. *(Archiv f. Ohrenh., Bd. X, p. 110.)*

The blades of the forceps employed were two cm. long, pyramidal in shape, four mm. wide at the base on the cutting surface, and five mm. wide on the side at right angles to the cutting surface. When brought together, the blades formed a triangular wedge-shaped blade one cm. wide and five mm. thick at its base, which permits quite a deep insertion into the auditory meatus. Much diminution in these dimensions would weaken the blades. Of course, when open for grasping a growth, the instrument cannot go into the meatus as far as when closed.

The chisel was nearly seven cm. long, and four mm. wide at the cutting edge.

DISCUSSION.

Dr. Knapp:—I have had considerable experience with the removal of exostoses from the various cavities about the eye and I have not shunned those in the auditory canal. To attack this ivory bone at the apex with a chisel is the most difficult and thankless task any one can undertake. In the orbit I have worked at such an exostosis four hours

and a half, and did not remove more than one half of the exostosis. According to my experience, the most efficient plan is not to attack the tumor at all with any instrument whatever, but to attack its base. When the tumor or its base is of cancellous bone tissue, it is easy to remove it. If the growth is pedunculated it may be cut off. In cases of sessile growths the correct way is not to attack the tumor, but to chisel on the healthy bone, just as we do in removing a cancer, not on account of malignity but for reasons of practicability. When we attack the base, the bone is not so hard and we get out all the roots of the growth.

In the after treatment, the utmost cleanliness and antiseptic precautions are of course very important on account of thrombosis. Often the secretions have been kept back by these tumors and are decomposed.

I have described such aural tumors as have been referred to to-day; one especially, in which I could remove the growth only by taking away the base with a portion of the adjacent bone from which it started. I think that I can recommend this procedure as safe, and for ivory tumors with a broad base as the only one practicable.

Dr. Andrews: — I fully agree with Dr. Knapp in what he has said with reference to the removal of osteomata. In a recent paper, I make a special point of the objection to attacking these growths at the apex. Where these tumors are situated in the orbit and the body of the growth itself is attacked, the amount of injury which may be inflicted upon the brain may be very serious. It would be far easier to fracture the plate of bone which lies against the tumor in osteoma of the frontal sinus by attacking the tumor itself than if we were to break down the bony surroundings of the growth, which latter is, I believe, the proper procedure.

Mr. Tweedy, of London, has published a remarkable case of osteoma of the frontal sinus —

Dr. Burnett, rising to a point of order:—I should like to say that so far as the discussion of my operation is concerned, it seems to have turned upon tumors of the orbit. My operation was not upon an entirely ivory-like bone, and Dr. Knapp, when he alluded to the removal of an exostosis at its base, made an exception in the case of pedicellated bodies like the one I operated upon. At the same time, ivory-like exostoses in the ear need not be removed by excision of the base. The remarks of Dr. Andrews were entirely with reference to operations about the eye. I am glad to hear these remarks, but they do not seem to me to be in order, in discussing a paper on the ear.

The President:—The discussion is a general one, and I do not see how we can suppress it. It is certainly in order.

Dr. Agnew:—Dr. Burnett has started a subject worthy of discussion. As specialists we should be careful to see that what we may do here shall belong to the great mass of surgery. I am therefore glad to see that there is really nothing new in the operation described. The chisel and bone forceps are instruments which have been used from time immemorial in the removal of osteomatous growths. The author has taken the ordinary instruments, reduced them in size and applied them to the removal of bony growths of the auditory canal.

Dr. Andrews:—Osteomata of the external auditory canal may be of the same nature as those of the ethmoidal and frontal sinuses and as Dr. Burnett observed that where the growth in the auditory canal is sessile, he would attack it at the apex, I thought that it was in order to refer to these cases by way of illustration. I was about to say that Mr. Tweedy, in his case, speaks of having broken all his chisels in attempting the removal of the osteoma by attacking the body of the growth, and had to abandon the operation, because he found that the growth involved so much

of the cranial cavity. I think with Dr. Knapp that these growths should be attacked from the base. I think that the wisest procedure is to pass a drill into the base and determine its nature. If the tissue be soft and spongy, the growth may be readily shaved off.

REMARKS UPON THE DIAGNOSIS OF CHRONIC LESIONS OF THE LABYRINTH OR ACOUSTIC NERVE WITH ILLUSTRATIVE CASES.

By D. B. St. John Roosa, M. D., *New York, N. Y.*

Before reading the paper, Dr. Roosa said:

Mr. President, I was interested in the remark made a few minutes ago by Dr. Theobald to the effect that the tuning-fork was heard in some cases better when placed on the vertex than when placed on the forehead, and the reverse. I have also found so many discrepancies with the tuning-fork that I have given up its use in all cases except to determine the relative duration and intensity of aerial and bone conduction. I instituted those experiments which were made by Dr. J. B. Emerson and which were the subject of a former communication. My conclusions may be incorrect, but I have been unable by my own criticism and that of others to show that they are. I therefore go on the assumption that in the relative duration and intensity of aerial and bone conduction, we have a simple and reliable test for the differential diagnosis of diseases of the middle and of the internal ear. Although I have myself invented one test which is highly spoken of by Dr. Hinton, I have abandoned its use with all the others except that I have just indicated.

There is still some difference of opinion among otologists, as to the reliability of our means of determining

in a given case between a disease of the tympanum and of the labyrinth. This I know to be so, from the fact that I sometimes make a diagnosis of disease of the labyrinth, cochlea or trunk of the nerve, and decline to institute any local treatment, for example, such as Politzerization, medication of the naso-pharynx, and so forth, in cases where such treatment has been advised or even carried on by other authorities. Although I may already have somewhat trespassed upon the patience of the otological public upon this theme, in view of the differences of opinion still existing, I beg to be allowed to again present some reasons for believing that many cases usually classed among affections of the tympanum should really be placed among diseases of the cochlea or acoustic nerve. These reasons only seem to me more conclusive as I have more opportunities for testing them. If I am correct in my views, much medication that is unnecessary may be saved, while, if I am wrong, the criticisms of my peers will ultimately correct the views, which as yet, although somewhat widely published, have not received any general attention or perhaps credence. I may refer to an article upon this subject in the Archives of Otology,* to a paper at the Basel Congress of 1886, and to my text-book. I propose in this paper to present a few typical cases taken from the last volume of my private case book. They, with the brief commentary that is made, amply illustrate what I have to say.

Case I.—A Sensation of Sudden Filling up of the Ear while Sleigh-Riding—Treatment for Disease of the Tympanum Without Benefit.

Mrs. F., æt. 51. March 7, 1887. The patient states that five years ago, after being out sleigh-riding in a cold winter's day, the left ear began to feel "stuffy" or "filled up", and that it has remained so, until now. It was examined by me one year after. The aerial conduction was then found to

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be better than that by bone, and no treatment was advised. The hearing power was much reduced as tested by the watch upon that side, but it was normal upon the other. After this, another physician was consulted, who, according to the patient, punctured the membrana tympani, practiced inflation and advised Turkish baths. No improvement followed this treatment. To-day the patient consults me on account of her eyes, and incidentally mentioned that her left ear was no better, and that the right one was getting in the same way. The patient is a robust looking woman, has several healthy grown children, but she complains of insomnia. The eyes are troublesome, simply from a refractive error (astigmatism). Examination of the ears confirms to my mind the diagnosis of four years ago. I can find no objective evidence of disease of the right ear, yet I am inclined to think that the patient is correct from her subjective symptoms and that she has an affection on that side also. The H. D. on the right side is $\frac{18}{18}$, L $\frac{c}{18}$. The aerial conduction is better than the osseous on both sides. The patient hears ordinary conversation addressed to her in a quiet room at 50 feet on the right side and 10 on the left. Nothing marked was observed in the naso-pharynx or in the membranæ tympani.

Remarks.—One ear being good in this case, it was impossible to observe the effect of noise upon the hearing power. We must, therefore, rely upon the evidence of the tuning-fork, the negative testimony of the inefficacy of a trial of treatment directed to the tympanum, the paracentesis and inflation, for a diagnosis. I think these are sufficient. It seems to me entirely probable that lesions may suddenly occur in the cochlea, or in the vestibule, or in the nerve trunk, which do not destroy the hearing, and which, so long as the semi-circular canals are not invaded, do not produce vertigo. Such a lesion occurred, as I think, during the exposure to cold of the sleigh-ride from which the patient dates her trouble with distinctness and positiveness. That a lesion of the tympanum may also have occurred I should be very far from denying. But if an affection of the tympanum and labyrinth occur simultaneously, for all practical purposes the disease should be characterized as one of the essential parts of the organ and not of the peripherical.

Case II.—Tinnitus Aurium for a Year in an Anæmic Woman. Impairment of Hearing for the Watch Very Marked.

Mrs. X., æt. 35. June 21, 1887. Over one year ago the patient began to suffer from tinnitus aurium, and six months later from impairment of hearing. There has been no pain or dizziness. Her general health is not good. She has been taking 15 grains of quinine daily for some time before the tinnitus began. She is anæmic and suffers from constipated bowels. She has had several miscarriages. She states that she had congestion of the brain some years since and that it was followed by hemiplegia of the right side. She thinks that she does not hear so well in a noise. H. D. on the right side $\frac{c}{fx}$, L $\frac{c}{fx}$. The light spot is small in the right membrana tympani, on the left it is irregular in shape. There are no marked appearances in the naso-pharynx. The aerial conduction is better than the osseous on both sides. The ordinary voice is heard at 20 feet.

Of course too much stress can never be safely laid upon patients' statements as to medicine they have taken, or diseases from which they have suffered. This patient may never have taken 15 grains of quinine a day, and she may never have had congestion of the brain and true hemiplegia. But she certainly was anæmic, and she had had miscarriages, and her hearing was affected and was worse in a noise. The tuning-fork also gave evidence of trouble in the nerve. For myself, the evidence is ample for a diagnosis of disease of the labyrinth or the nerve.

Case III.—Impairment of Hearing for Four Years. Occasional Dizziness. Deafness Ascribed to Listening to a Voice in a Speaking Tube.

Mrs. Q., æt. 46. Feb. 28, 1887. This patient has observed that the hearing of the left ear has been impaired for the past four years. She does not suffer from tinnitus except after a dose of quinine. She is occasionally dizzy. Her general health is poor, that is, she says that she is "nervous". She is anæmic. She thinks her trouble in her left ear is due to continued and frequent listening through a speaking tube to a voice from a floor below, in that ear, while attending a sick relative some 14 years ago. She distinctly remembers that this act of listening often

caused pain and discomfort at the time. The hearing power as tested by the watch is R ½. L ½. The aerial conduction is better on each side. The right membrana tympani is sunken; there are two light spots. The left presents the same appearance, and although there is no history of suppuration, there is a cicatrix upon it.

It is quite in the natural order of things that the origin of this trouble was in the concussion of the labyrinth produced by the voice through a speaking tube. From the existence of a cicatrix upon the drum head, of which there was no history, we may perhaps assume that there has been a suppurative process here in infancy or early childhood, which has been forgotten. Such a condition would leave the ear more susceptible to concussion. The late Dr. Edward T. Ely and myself reported a case where a kiss upon the ear ultimately caused a lesion of the labyrinth, and a similar case has been reported in Austria. I have also reported cases in which ears were damaged by the click of a telegraphing instrument.

Case IV.—Neuralgic Pains in the Ear. Impairment of Hearing.

Miss T., æt. 48. March 3, 1887. The patient does not observe any considerable loss of hearing, but she states that her hearing is not as good as it was formerly. She has had neuralgic pains in one ear for the past ten nights, and it is on this account that she seeks advice. By the watch H. D. on the right side is ½. L ½. She hears ordinary conversation readily in a quiet room at from 30 to 40 feet. There is nothing marked in the appearance of either membrana tympani. The aerial conduction is better than that through the bone on both sides.

I found nothing worthy of local treatment in this case. This patient consulted me chiefly on account of a refractive error, and I do not think she lays any great stress upon the condition of her ears, and yet there was positive loss of hearing when the conditions were not favorable for acute hearing.

Such cases are very frequent in my experience, and they are very apt to be found in anæmic persons.

Case V.—An Overworked Physician Suffers from Unpleasant Sensations in his Ears.

Dr. X., æt. 46. February 5, 1887. The patient is a married physician of excellent habits, in large general practice, somewhat overworked and lately very anxious and nervous, who has suffered for the past seven weeks or more with a sense of fullness in his ears and tinnitus. He is quite sure that he feels worse every other day. There is no pain in his ears and he is not dizzy. His hearing distance is R $\frac{1}{10}$. L $\frac{1}{15}$, and he has no difficulty in hearing the voice in a quiet place. The aerial conduction was better than the osseous on each side. He was very nervous and anxious. He did not sleep well and was scarcely able to attend to his practice. He seemed to me to be under-fed, he having been fearful of over-eating. He took no alcoholic stimulants. I unhesitatingly gave my opinion to this patient that he was suffering from a central lesion or one at least of the acoustic nerves, and that in all probability it had a malarial origin, or that at least it was influenced by malaria. I advised him to give up work, to take alcohol and quinine and to go to a warmer climate for a few weeks. He then told me that his affection had been considered to be one of the tympanum and that inflation had been recommended and thoroughly employed but without benefit.

Case VI.—Difficulty of Hearing in a Noise.

Male, æt. 44. Banker. This patient has been troubled for some years with difficulty in hearing in a noise. There is no tinnitus aurium, dizziness or pain. His general health is good. He has muscular rheumatism at times. Hearing distance R=$\frac{1}{20}$, L $\frac{1}{20}$. The voice in common conversation is readily heard in a quiet room at 20 feet, and it could have been heard much further, but the size of the room did not admit of tests. The aerial conduction was better than the osseous on both sides. Both membranæ tympani were sunken, and there were two small light spots. The uvula was elongated.

This belongs to a common class of cases in people more than forty years of age. Discrimination in diagnosis prevents much unnecessary worry as to an ultimate loss of hearing, such as would occur were the affection one of the tympanum.

Case VII.—Sore Throat and Tinnitus Aurium. No Impairment of Hearing for the Voice in Quiet Places.

Male physician, æt. 42. May 5, 1887. One year ago the patient states that he had sore throat on the right side and tinnitus in the right ear

He does not think that he hears well. He has been in the habit of inflating his ears by the Valsalvian method. His naso-pharyngeal space has received considerable treatment at the hands of competent specialists. He is exceedingly anxious about his hearing power. Hearing distance R $\frac{18}{18}$, L $\frac{18}{18}$. Hears low conversation absolutely without difficulty in the quiet of the consulting room. The aerial conduction is better than the bony conduction on each side. The membranæ tympani are of good color. The light spot is divided into two on the right side and is small on the other.

This was one of the cases where the correction of an erroneous diagnosis was of manifest value to the patient. His attention had not been called to his loss of hearing by his conversation with his patients or friends, but by the tests made by a watch and his subjective symptoms. To be assured that he did not have a progressive disease of the tympanum, which would ultimately render him deaf except in a din, was of itself a boon. Unless the doctor acquires a tympanic trouble or an increased nerve disease he will always hear well in a quiet place, and be fully able to practice his profession with comfort as far as hearing is concerned.

Case. VIII.—Impairment of Hearing and Dizziness. Tympanic Disease Engrafted upon one of the Labyrinth.

G. M., æt. 40. February 2, 1887. For 12 years this patient has been troubled more or less with impairment of hearing and occasional dizziness. Tinnitus he has suffered from constantly. He is not suffering from dizziness just now. He is apparently in fair health, but he is very nervous and does not sleep well. Some years ago he had malarial fever while on the east coast of Africa and took a great deal of quinine. He states that his hearing is worse when he takes cold. He has not observed whether or not he hears better in a quiet or a noisy place. His hearing distance is R $\frac{5}{40}$, L clicking of nails at 12 inches. The aerial conduction was better on each side. The right membrana tympani was opaque and sunken; there was no light spot. The left was in the same condition, except that there was a small light spot.

Dr. Emerson and myself were much in doubt in regard to the nature of this case. To those who do not lay much stress upon the evidences from the proportion between the aerial and osseous conduction, and who attach considerable importance in all cases to the conditions of the membrana tympani, it may seem that the history of being worse whenever he had a cold, with the sunken drum heads, proved that this was an ordinary case of tympanic disease. To us it seemed, and very clearly after he had been under treatment for about 20 days, that it was predominantly a case of central lesion or one of the acoustic nerve, upon which was engrafted a tympanic catarrh of one side, or that the original trouble was a panotitis or combined affection of the tympanum and labyrinth, from which partial recovery had taken place. We decided upon the treatment by inflation, especially for the left ear. After 9 inflations in 20 days, the patient's hearing distance had arisen to $\frac{15}{40}$ on the left side, while it remained the same as on the first day we saw him on the right. He had, however, had several attacks of vertigo during the period of treatment. We then advised a discontinuance of the inflation and that the mastoid process of each side be kept sore by a blister.

This treatment was continued almost constantly for more than 90 days. He seemed to be very much improved. He had no vertigo or tinnitus. His hearing distance was R $\frac{20}{40}$, L $\frac{18}{40}$, and he was much more competent and cheerful in his business. Dr. Allan McLane Hamilton saw him once or twice during the time he was under the care of Dr. Emerson and myself. Dr. Hamilton made a diagnosis of aural vertigo and nervous exhaustion, and advised strychnia.

The foregoing cases could easily be multiplied in my experience. I have simply gone over my case book for the past six months, and have taken a few upon which to base

my article. I think the society must have been struck by the fact that all these patients were in the middle period of life, the time when the cares and troubles are most pronounced or at least most appreciated. Such patients very often exhibit symptoms of nervous exhaustion. Though I am not a believer in much general medication in chronic diseases of the middle ear, cases of chronic lesions of the labyrinth of this type, I believe, may be much benefited by such drugs as strychnia, arsenic and quinine. Nowhere is a knowledge of the effects of drugs more valuable than here, always of course with appropriate and careful hygienic care.

The universal use of the watch as a test of hearing occasionally leads to false conclusions on the part of general practitioners, especially who discover in themselves or their patients a loss of hearing as tested by the watch alone. When used alone I regard it, for reasons long since given by me, as utterly insufficient.

Only very recently, a gentleman with considerable knowledge of aural practice came to me in great alarm, because, although his hearing was not noticeably impaired for the voice, he had discovered that he could not hear the watch but a few inches from his ears. When the watch and voice are both heard badly, there is indeed cause for anxiety, but many people go through life with some lesion of the nerve which causes them to hear a watch and certain other tones badly, who hear conversation fairly well until their lives are ended.

I have in my mind a conspicuous example of this kind in a lawyer of middle life, whose acoustic nerves were injured by cannonading during the Civil war.

In my opinion, people who hear conversation relatively better than the watch or acoumeter, who hear better in a quiet place than in a noise, who hear the tuning-fork c^2 better and longer through the air than through the bones,

suffer from some lesion of the labyrinth or nerve, and not from disease of the tympanum: and I believe a general adoption of this view would stop a great deal of local treatment of the naso-pharynx and tympanum, and greatly simplify and improve our therapeutics.

DISCUSSION.

DR. BURNETT:—I would ask what was the result of treatment in case Number Five?

DR. ROOSA:—I saw the gentleman but two or three times. I have heard that he is better but have not seen him.

A MEMBER:—In case Number Two, was an inquiry made as to syphilis? The history of miscarriages, hemiplegia, etc., would suggest such a possibility.

DR. ROOSA:—I always make that inquiry either directly or indirectly. I acquired that habit in my hospital days and have not given it up. In this case I could not determine this point positively, but I think there was no syphilis.

DR. SEXTON:—We all see many of these neuræsthenic cases. My own experience with them, and I have seen many, is that such run down and nervous persons pay a great deal of attention to symptoms that under ordinary circumstances would be entirely unobserved. Nearly all such patients have catarrh of the upper air tract and with this there are annoying acoustic phenomena for which they come for consultation about the ear. My own views as to the seat of the trouble have been stated so often that it really seems useless to repeat them. I have seen no reason to change my mind as to the seat of the trouble, which I consider to be the middle ear. No treatment may be necessary, even if the disease is located in the middle ear. Such patients are liable to be much over-treated.

Dr. Gruening: — In the cases referred to by Dr. Roosa, there are three distinct sets of symptoms, diminution in hearing, tinnitus and vertigo. I think that it is the vertigo which is the most annoying and patients come chiefly on account of this symptom. I would ask Dr. Roosa how these symptoms are influenced under treatment? What becomes of the vertigo? How soon does it disappear? What becomes of the tinnitus when connected with such vertigo? What effect has the treatment upon the diminution of hearing in these cases?

Dr. Roosa: — The class of cases which I have been attempting to describe do not quite come under the head of the class to which Dr. Gruening has referred. There are two classes entirely distinct. There is one class of patients who suffer from vertigo as a marked symptom, and I would agree with Dr. Gruening in assuming that in many of these cases there was disease of the semi-circular canals, or pressure on the semi-circular canals. This is one class. I fear that I did not make myself perfectly clear. I did not wish to speak of that class at this time. I have a great interest in these cases, but I did not mean to discuss them at all. I intended to discuss those cases who as a rule are not accompanied by vertigo. There is a large class of cases which I believe has not been looked upon as I look upon them. I have been endeavoring to describe them, and intimate my opinion that they are being treated as cases of tympanic disease while they are not.

I rely upon the test of the relative duration of the sound of the tuning-fork, but, in doubtful cases, I always give the patient the benefit of the doubt and employ two or three thorough inflations at different intervals. I rely upon this series of tests, the tuning-fork test, the hearing better or not in a noise, and the relative better hearing of the voice than the watch. There are a number of little things which

come in, such as being disturbed by a noise. This condition is apt to occur in persons in middle life, and if they have any nasal or other trouble, the suggestion is at once that there is tympanic disease. I do not agree with that view. I hope that Dr. Gruening will consider that I have sufficiently answered his question.

DR. GRUENING: — Are the cases which Dr. Roosa speaks of benefited by general treatment?

DR. ROOSA: — I think that on the whole they receive very little positive benefit to their ears from treatment. In other words, they seldom hear the watch or the voice better after treatment than before. I regard the aural condition as practically incurable. There is a very important point here. For example, one of these cases was a physician who was under the impression that he was losing his hearing and would not be able to continue with his profession. He had been undergoing a course of treatment for tympanic disease, and anxiety was making him ill. If you can, as I think that you can, assure these patients that if the general health is looked after carefully and with wisdom, they will never hear so badly that they can not hear in a quiet place, — which is ample for a physician, enough for a lawyer and sufficient for most occupations of life except those where the individual wishes to hear in noisy places, as is the case with engineers, conductors and the like, — while we can not remove the disease, we can do much by improving the general condition and the morale of the patient and by assuring him that, unlike tympanic diseases, the trouble is not likely to become worse. The moral effect of this is marked. It makes the patient happier and enables him to dispense with much useless treatment.

DR. HOLT: — Dr. Roosa's paper has interested me very much. Several years ago I made a series of tests with the *c* tuning-fork, etc., the results of which have been

published in the Transactions of the Society. I have continued these tests whenever time permitted, and tried to formulate the results so I could agree with Dr. Roosa. In the average normal ear we find the ratio of bone to aerial conduction for the *c* tuning-fork to be about as one to four, although in individual cases there will be quite a degree of difference. In a certain number of cases with defective hearing, Rinne's experiment will be positive, although all the symptoms point to middle ear disease and none to disease of the internal ear. In a much larger class of cases with defective hearing Rinne's experiment will be negative, the loss of hearing being due to middle ear disease, while in a few cases of this character, other prominent symptoms point unmistakably to disease of the internal ear. In marked diminution of bone conduction or in its absence, while the tuning-fork is heard by air conduction, there is unquestionably disease of the internal ear. We have a large class of cases come to us for treatment, where the bone conduction is less than the aerial conduction, the ratio ranging from 1 to 2, 3 or 4. Some of these cases make marked improvement under treatment for the middle ear and naso-pharynx and call themselves well. We have a smaller class of patients in which Rinne's experiment is negative, but upon treatment for the middle ear and naso-pharynx, along with improvement in hearing, Rinne's experiment becomes positive. I should like to know what degree of deafness and what ratio there should be between bone conduction and aerial conduction in order that it may be diagnostic of disease of the internal ear. With reference to the tick of a watch, as a test for the hearing power, I think it is difficult to obtain satisfactory results with an ordinary watch. I have had my watch made with a stop and I am confident that the results obtained would be more unsatisfactory without this provision. In my own case there would appear to be an

exception to Dr. Roosa's theory. I can hear the tick of my watch only an inch or two from my ear. The *c* tuning-fork is heard about three or four times longer by aerial conduction than by bone conduction. In a quiet room ordinary conversation is heard distinctly. In the moving cars, I can hear conversation as carried on more readily than a person with normal ears and yet from numerous tests I am confident that a given sound can not be heard better in a noise than in a quiet place. In a large number of examinations of persons who thought they could hear better in a noise, I never have found one who could hear a given sound better in a noise than in a quiet place.

Dr. Sexton: — Even if some of these phenomena are located in the tympanum, local treatment is not necessarily indicated, as might be inferred from what has been said. I do not understand what the patient gains from the view that the disease is located in the cochlea. It seems to me that such a belief would tend to make him more nervous.

Dr. Roosa: — If I understood Dr. Holt correctly, he said that he did not hear the watch well, that he could hear in a quiet room and that in the cars he hears better than a person with normal hearing. This would contradict the ideas which I have had. In my experience, a person who hears well in a quiet room and hears the watch badly, always hears worse in the cars and in any noisy place than he does in a quiet room. I should like to have an opportunity of testing Dr. Holt's hearing for myself.

I think that Dr. Sexton has misunderstood my remarks. I do not console the patient with the statement that the disease is located in the cochlea, but I endeavor to console him with the statement that the impairment of hearing will not progress. I tell him that there has probably been damage done to some part of the ear which has impaired the hearing for certain tones and conditions, but

that under favorable conditions he will be able to hear very well. The consolation that I give him is not anatomical, but moral.

Dr. Seely: — I would ask Dr. Roosa if he thinks that an affection of the nerve would be as likely to stop progressing as a trouble in the middle ear? He states that if the affection is in the nerve, the probabilities are that it will not progress.

Dr. Roosa: — I cannot answer definitely, except to go back to the analysis of cases. I think that in what I call a lesion of the nerve — the lesion which answers to the train of symptoms described — experience goes to show that these patients go on for years without any change and continue to hear under favorable conditions, while chronic disease of the tympanum is essentially progressive and goes on in spite of all that can be done.

Dr. Capron: — I would ask Dr. Roosa if he has ever noticed any relation existing between the possession of the so-called musical ear, and the ability of such to hear a watch well. I recall two patients I happened to be attending at the same time, both females, about 70 years of age, one of whom could hear my watch at 5 inches, but could hear only loud conversation close to the ear. The other heard the watch only on contact, but could hear the voice in ordinary conversation. Since then I have attempted to note whether or not there was any positive relation, and was of the opinion that the so-called musical ears heard the watch better.

Dr. Roosa: — In reply to Dr. Capron, I would state that I have known some persons who have a pretty good musical ear and yet hear the watch very badly.

A CASE OF CEREBRAL ABSCESS FROM SUPPURATION IN THE MIDDLE EAR. DEATH FROM MENINGITIS. PRESENTED WITH THE TEMPORAL BONE OF THE AFFECTED SIDE.

By D. B. St. John Roosa, M. D., *New York, N. Y.*

On the 4th of May, 1887, a South American boy, 11 years of age, who was in school in Orange county, was sent to me by his teacher, on account of a painful swelling over his right ear. His older brother stated that the boy had had some trouble with his ear, two years before, from which he entirely recovered. The history was imperfect, but he stated positively, as did the little fellow himself, that he had had no discharge from the ear. Pain was the only symptom of which a clear account was given. For the past three months, he has complained of tinnitus aurium, and of vertigo on getting up from bed. A month ago he began to have pain in the ear, and a week later a swelling appeared above the ear. For the past few days he has had fever. The ear is said to have been treated by fluid injections, the blowing in of powders and by poultices. The hearing distance on the right side seems to be $\frac{20}{40}$, and the bone conduction is better than the aerial. The hearing power on the left side is normal. The bottom of the right auditory canal is packed with a whitish substance, probably a powder. Immediately above and in front of the auricle there is a swelling of about the size of a black walnut, which is tender and fluctuating. There is no tenderness at the apex of the mastoid process. The temperature is normal. On the next day, the patient was placed in the Post Graduate Hospital, and put under ether,

and a free incision was made into the tumor. At least half an ounce of laudable pus was evacuated. No fistula was discovered, but the squamous portion of the petrous bone was bare nearly over its entire surface. The opening was packed with oakum. The patient did well for nine days. The opening was nearly healed with no burrowing of pus. The temperature remained normal night and morning. All pain was gone and the little fellow was up and about his room. The hearing distance remained $\frac{2}{40}$. After several examinations of the auditory canal, I was unable to positively say what was the condition of the drum head or tympanum. A whitish hard substance was lying in it, which ordinary injections of hot water made no impression upon. On the ninth day, nausea and vomiting set in. Dr. Emerson, who made the morning visit, immediately said that the vomiting was the characteristic forcible ejection of meningitis. The temperature arose rapidly to 104°, the patient sank into a condition of semi-coma and he died from heart failure in the early morning of the 14th, ten days after I first saw him and nine days after the abscess was opened.

POST MORTEM EXAMINATION.

This was made by Prof. W. H. Porter, M. D. There was a small amount of cerebral fluid. A little pus lay behind the optic commissure. There was considerable serum in the left ventricle, pus in the right ventricle. There was an abscess $1\frac{1}{2}$ inches in diameter in the temporo-sphenoidal lobe. It lay one half an inch from the surface of the brain, and was lined with a thick membrane. The cartilaginous portion of the auditory canal was thickened, and the caliber of the passage was much reduced. The membrana tympani was perforated above and behind. The auditory canal, tympanum and mastoid cells were filled with caseous material. The upper wall of the canal was necro-

tic. This necrosis extended to the roof of the tympanum, over a space as large as a silver half dollar. On the inner surface at the junction of the mastoid and squamous bones, opposite the base of the zygoma, is a spot of necrotic bone about half an inch in diameter.

REMARKS.

On removing the brain and opening into the abscess in the temporo-sphenoidal lobe, my first impression was, that I had neglected to embrace the opportunity to evacuate a cerebral abscess, an opportunity which if availed of might have saved a life. But we did not know there was an abscess beneath the bone, although that was discussed by Dr. Emerson and myself. If, however, we had known it, evacuated it, secured thorough drainage of this large abscess by an opening in the bone, and an incision into the brain substance, the condition of the temporal bone, necrotic as it was, would have led as it did to meningitis and death. The boy died not because of the pus in the brain substance but from inflammation of the meninges. I never knew until death of the complete blocking up of the tympanum, mastoid cells and canal with this product of inflammation. The history of this case becomes plain in the light of the post mortem examination, and I think it will be, like most such examinations, a contribution of some value to the pathology of aural disease.

The patient in the beginning suffered, without doubt, from an acute suppuration of the tympanum, which perhaps was not attended by very much discharge. The inflammation extended to the brain through the roof of the tympanum, and the cerebral abscess, which may have existed for months, had its origin from this point. The meningitis was of different origin, probably from the disease of the squamous portion of the bone. I regret that I did not attempt to remove the powder and caseous material from the ear while the patient was under ether.

A CASE OF ACUTE SUPPURATION OF THE TYMPANUM OCCURRING IN A PATIENT WITH CHRONIC BRIGHT'S DISEASE. DEATH. DESCRIPTION OF THE TEMPORAL BONE.

By D. B. St. John Roosa, M. D., *New York, N. Y.*

Mrs. X., æt. 42, came under the care of Dr. J. B. Emerson and myself on April 11, 1887. She was suffering from intense pain referred to the left ear. This had existed since the day before. Her hearing was so much impaired by chronic non-suppurative inflammation of each middle ear, that she could only hear conversation when directed into the auditory canals. She states that she hears much better in a noise. She does not hear the watch at all. The bone conduction is better than the aerial in each ear. The pharynx is in a catarrhal condition. There is a watery discharge from the left auditory canal. The right membrana tympani is opaque, has a reddish tint and has several light spots. The left drum head is perforated and the watery discharge is from the tympanum. The hot douche was advised, as well as Politzer's method of inflation. The patient is anæmic. Two days after there was some tenderness over the mastoid, and the patient was ordered to go to bed. Leeches and poultices were applied and the hot douche continued. This treatment was continued with varying success until April 25, 14 days after she was first seen, at some times the symptoms being greatly relieved, when the pain in the ear and the tenderness on and behind the mastoid increased to a great extent. The discharge from the ear which had been quite abundant became less and

the temperature, which had not been increased, became 100°. Leeches were again applied to the mastoid, and the next day as the perforation seemed to be closing, Dr. Emerson performed a paracentesis of the drum head. Considerable serum and pus were evacuated. These procedures gave relief for about 36 hours but then the pain and tenderness have again returned. The point of most acute tenderness is about two inches behind the auricle at about the junction of the temporal with the occipital bone. The temperature was 103.5°. Another paracentesis was performed, two leeches were applied and the patient was sent to the Post Graduate Hospital. On admission to the Hospital the urine was examined and the patient was found to be in the advanced stages of Bright's disease. After a varying course of pain and relief she finally began to have pulmonary œdema and she died on May 15, about 34 days after she was first seen.

The question of abscess of the mastoid was carefully considered by Dr. Emerson and myself, many times during the progress of this case. Although there was great pain and tenderness in this part, the crucial test of tenderness at the apex, gave a negative result and we always came back to the conclusion that the disease was essentially a suppuration of the tympanum, occurring in tissues that had become rigid from chronic disease. Hence the necessity for frequent paracenteses. After the examination of the urine had revealed the condition of the kidneys, the waxy pallor, the nutritive failure, and the merely temporary relief from the local means, were explained. We gave the family of the patient a very unfavorable prognosis as soon as the evidence of advanced Bright's disease was before us. The post mortem verified our ideas of the purely tympanic nature of the case. It is to illustrate this point chiefly that the specimen is exhibited.

The post mortem examination was made by Prof. William H. Porter, whose report is as follows:

There were the characteristic appearances of Bright's disease in the kidneys and other organs.

The temporal bone was sawed into several fragments, opening the mastoid cells, and also the middle ear. One cut was made to divide the external auditory canal nearly in the centre of its long axis, from above downward. By this incision the drum was divided and the middle ear opened. The cavity of the tympanum was completely filled with thick pus in which the small bones were imbedded. The incus and malleus were secured, but the stapes could not be found. The periosteal covering of the two found was acutely congested. The wall of the tympanic cavity was softened by a carious process which had destroyed the layer of bone separating the aqueduct of Fallopius from the cavity of the middle ear. The seventh nerve was exposed and lay in this cavity of pus. The mastoid cells were found to be free from disease.

DISCUSSION.

Dr. Carmalt:—The author speaks of tenderness at the apex as though that were an almost infallible sign of suppuration of the mastoid cells. I would ask if we must always find that sign, or, not finding it, not operate?

Dr. Roosa:—I think that this is a very strong test. We based our opinion in this case on the fact that we could never elicit any true tenderness. It is a valuable test but by no means infallible.

Dr. Burnett:—I suppose that Dr. Roosa means that this tenderness is a strong sign when taken in connection with other symptoms. For we may have this tenderness when there is no other symptom of mastoid disease.

In connection with the first case reported, I should like to ask whether there was reason to suppose that the

disease had begun in the external auditory canal? This chole-steatomatous mass was found in the external ear. Did it begin in the canal and go inward, or did the mass work from within outwards?

Dr. Roosa:—I am inclined to think that this was an ordinary case of suppuration of the tympanum which had never been diagnosticated and had never been thoroughly treated, and that the affection did not commence in the canal. There was a perforation in the membrana tympani, and caseous material formed in the tympanum. Some of this matter was mixed with powder and it was impossible to say how much of the material in the auditory canal was caseous matter and how much powder.

Dr. Gruening:—I have this winter seen a number of cases of post-auricular abscess in children and in adults. I opened the abscess and in those cases where the abscess had been preceded by otitis media purulenta I opened the mastoid cells also. In four of seven cases, the mastoid cells were filled with pus. I established thorough drainage and the patients made good recoveries.

I speak of cases in which the cortex of the mastoid was not diseased, of cases of otitis media purulenta with post-auricular abscess. In the majority of cases of this kind, pus will be found in the mastoid cells also. As opening of the mastoid is without danger, I think that we are justified in opening the bone in all these cases.

Dr. Fryer:—I would ask whether or not the abscess and the lesion of the membranes were of the same duration, or whether the abscess had preceded the other lesion?

Dr. Roosa:—I think that the abscess was of long duration, months, possibly years, and quite distinct from the condition with which he died, although the abscess was undoubtedly induced by the early tympanic disease.

Dr. Andrews:—Was the point of perforation discovered?

Dr. Roosa:—I think that the perforation occurred in the roof of the tympanum and that the abscess had its origin there. The abscess which I opened was over the squamous portion of the bone. The cerebral abscess must have originated from the roof of the tympanum.

Dr. Andrews:—A point with reference to the location of the perforation was brought out by Mr. Baker who performed the operation in Gowers' case. He stated that in the majority of instances the abscess resulting from middle ear disease was located in the temporo-sphenoidal lobe and resulted from perforation of the roof of the drum cavity. I am not quite sure that that statement is correct. Mr. Baker held that in mastoid disease when the symptoms persisted after opening of the mastoid, the surgeon was justified in opening the brain. That was about the only ground that Mr. Gowers had for advising Mr. Baker to open the abscess in his case which was found in the temporo-sphenoidal lobe. In that case the mastoid had been opened, but the elevation of temperature, the chills and the pain in the head persisted. These were the only symptoms that made Mr. Gowers feel justified in recommending an exploratory operation. There were no positive symptoms indicating any particular part of the brain as the seat of the lesion; it was therefore really groping in the dark.

I should like to ascertain the feeling of the Society with reference to the propriety of operating in those cases of mastoid disease in which the temperature suddenly rises, which is an important symptom as indicating phlebitis. During the past two years, I have been much interested in this subject and have seized every opportunity of seeing operations upon the skull. I have seen an operation done for cerebral abscess where it was supposed that the abscess was in the temporo-sphenoidal lobe, when it really was in the cerebellum. There were in this case no

symptoms except high temperature and chills, pointing to other than simple ear disease.

With reference to the second paper, I would ask whether we are not justified in operating in those cases of Bright's disease and of diabetes where we meet with mastoid disease? Is either of these diseases a contra-indication to operation on the mastoid? We know that the opinion of surgeons with reference to this matter has changed within the last few years. Since Spencer-Wells, in consequence of an error in diagnosis, performed laparotomy for the first time in tubercular peritonitis, with the result that the patient remained healthy for ten years afterward, many similar observations have been made. Amputations have been performed in diabetes, with good result, and so on. Therefore the presence of grave constitutional disease is not always necessarily a contra-indication to the performance of a serious surgical operation.

Last July I opened the mastoid in a man who improved very much after the operation, but who six months subsequently died of phthisis. He did not die because the mastoid had been operated upon. I believe, however, that the disease in the mastoid would have killed him in time, for it was the seat of extensive osteo-porosis. Is it the opinion of the Society that we are justified in operating in these cases when mastoid disease is undoubtedly present?

Dr. Howe:—The relation of this case recalls one formerly under my care. A child was brought to me with the usual symptoms of otitis media purulenta and it was stated that good results had been obtained from the use of powders of alum and boric acid. For a time this was continued. To my surprise, I found developing the typical symptoms of mastoid trouble. I can not recall that there was any tenderness at the apex, and in passing, I may say that it is something new for me to have so much stress

laid upon that symptom. I etherized the child and removed every particle of the accumulation in the outer ear. After doing this all the alarming symptoms disappeared. I might have been tempted to open the mastoid, if I had looked upon this operation as a slight affair. It, however, seemed better to me to thoroughly clear out the external ear first.

Dr. Sexton:—With reference to the tumefaction spoken of by Dr. Roosa, I have seen it where the purulent matter has dissected its way beneath the membrana flaccida and under the membrane of the canal. In acute cases it not uncommonly almost completely closes the canal and prevents a view of the drum head being obtained. The inspissation of pus after death would in this case account for the tumefaction present in the canal.

Dr. Carmalt:—I wish to understand with reference to the period that this abscess had existed. I think that Dr. Roosa stated that it had in all probability been present for months, basing his opinion on the firmness of the walls of the abscess.

Dr. Roosa:—I think that there were two processes here. I think that the cerebral abscess arose from disease occurring in the tympanum and extending through the roof. Subsequently the boy had a relapse involving another portion of the ear and leading to this superficial abscess on the squamous portion of the temporal bone. I think it possible that the abscess existed a number of months and before the occurrence of the acute attack. It certainly did not develop within a few weeks.

Dr. Carmalt:—I am reminded in this statement of a case belonging more particularly, however, to general surgery, in which there was a cerebral abscess which I attempted to open. The abscess was the remote result of an injury over the parietal bone, received two months before, and in which the *first* symptoms of suppuration

in the brain substance did not occur until about three weeks before death. The patient was regarded as about well, was soon to be discharged from the hospital; but, indulging too freely in stimulants, two days afterward the cerebral symptoms appeared. I passed my knife deeply into the brain substance, in the direction in which I thought the abscess to be, and at about two inches experienced a sense of resistance, and then, forcing it half an inch further, I turned it upon its axis, but found no pus. The man died on the second day after and at the autopsy a partially emptied abscess was found in the direction in which I had passed my knife, but the contents of the abscess were emptied into the lateral ventricles. The wall of the abscess was so thick that it had resisted the point of a sharp bistoury, but the pressure had ruptured the abscess into the lateral ventricles. In this case, *all* the lesions must have occurred within two months, the original injury being received then, and the symptoms of abscess were not more than three weeks: yet the wall was sufficiently thick to resist the point of a sharp knife. I therefore think it unsafe in the case before us, to conclude that, because the wall was thick, it had existed for months. An abscess wall of considerable firmness may be developed in a few days.

Dr. Sutphen:—A few months since I assisted at a post mortem examination where an abscess was found located in the middle lobe, and communicating with the cavity of the middle ear. Adjacent to this was a cicatrix, showing where there had been an abscess which had healed. Whether or not this had communciated with the middle ear, as the existing one, is uncertain, but the patient, several months previously, had had symptoms corresponding to those of cerebral abscess, and apparently recovered.

A CASE OF RAPID AND ALMOST TOTAL LOSS OF HEARING IN A CHILD, SEVEN YEARS OF AGE; INHERITED SYPHILIS APPARENTLY THE CAUSE; MARKED IMPROVEMENT FOLLOWING THE USE OF THE IODIDE OF POTASSIUM.*

By Albert H. Buck, M. D., *New York, N. Y.*

A child, seven years of age, and of somewhat delicate appearance, was brought to me by his parents on January 11th, 1887, for the relief of pronounced deafness. The history given by them was, in brief, as follows:

About three weeks previously the child had what seemed to be an attack of croup, which lasted four or five days, and was followed by impaired hearing. The deafness rapidly became so marked that it was almost impossible to communicate with him by speech. Previously to the present attack the child, it was said, had never shown any signs of impaired hearing, although on cross examination the parents admitted that they had sometimes observed a certain degree of inattention on his part, yet not sufficient to make them suspect impairment of the hearing power.

Inflations of the middle ears according to Politzer's method were resorted to promptly by the physician in attendance, and were continued, at regular intervals, up to the time when I saw the case—that is, for a period of about two weeks. Noticeable improvement in the hearing, lasting for a few minutes, or for an hour or two, followed these inflations. In the main, however, the hearing power diminished rather than increased, during this period.

*Read by title.

At the time when I first saw the child there seemed to be, for all practical purposes, total deafness. From the statements made by the parents, and also from my own observations, I became satisfied that there were brief intervals of time during which the hearing was sufficiently acute for the child to distinguish correctly at least some of the words that were spoken loudly into one or the other ear. A careful inquiry into the previous history revealed nothing that might throw light on the nature of the aural affection. There had been no complaint of pain, no staggering or uncertain gait, no paralysis. On examination, both drum membranes were found to present a somewhat dull and sunken appearance. The dull appearance was of such a nature as to suggest the presence of mucus in the drum cavities. However, when air was forced into them by aid of the Eustachian catheter, the sound conveyed to my ear through an auscultation tube was that of air entering freely a tympanum of undiminished size and free from the presence of fluid. This satisfied me that the dullness observed was due, not to the presence of mucus, but rather to an œdematous condition of the mucous membrane on the reverse side of the membrana tympani. The hearing seemed to be impaired to an equal degree in both ears. There were ample evidences of nasal and naso-pharyngeal catarrh.

In the matter of a diagnosis I was obliged to confess that both the nature and the precise seat of the disease were unknown to me. The rapidity with which the hearing had disappeared, and the apparent absence of physical changes in the middle ears adequate to explain the deafness, favored the hypothesis of lesions involving the labyrinth; while, on the other hand, the development of the deafness in connection with a croupy attack, the existence of decided catarrhal manifestations in and about the ear, and the temporary improvement brought about by inflations of

the drum-cavities, favored rather the idea that the affection was, after all, simply a subacute catarrhal inflammation of the middle ears with an unusual degree of secondary labyrinthine congestion. At that time there were no visible lesions in the external auditory canals; or, if they were present, they were so insignificant as to escape my notice.

Under these circumstances I gave a guarded prognosis, and recommended a plan of treatment based on the supposition that the disease was simply catarrhal in its nature.

On January 26th, I noticed, for the first time, the existence of a circumscribed area of redness (localized periosteitis) on the posterior and upper wall of the right external auditory canal, in close proximity to the membrana tympani. The redness of the skin did not extend perceptibly beyond the periphery of the latter membrane. An examination of the left ear showed that almost precisely the same condition of the parts existed in that ear; the only difference being that the redness was somewhat less pronounced on one side than on the other. In the absence of pain, of fever, and of any other sign of an ordinary inflammation, and from the fact that the family history was not entirely free from a tubercular taint, I drew the inference that the case in hand was one of tubercular osteitis involving the bony floor of the antrum, and extending inward and forward as far as to the fenestra ovalis and probably into the labyrinth itself. With this new light on the case I suggested to the attending physician that in addition to the inflations and tri-weekly applications of silver nitrate to the vault of the pharynx, cod-liver oil and Huxham's tincture of cinchona should be administered internally, and a modified Wilde's incision* made behind the right ear. It was hoped that, by the aid of the decided counter-irritation which would be established by this last

*Incision of the mastoid integuments, followed by stuffing of the wound with lint or other irritating material.

measure, the inflammation of the bone might be made to subside.

February 10th. The incision was made as suggested, but the localized periosteitis still persists, and, so far as the eye can discover, it has not materially diminished in degree. The external wound has healed. There is a slight improvement in the hearing, according to the statement of the parents, but it is not recognizable by the physician.

February 15. Incision repeated, on the same side, and wound stuffed with coarse oakum, with a view to exciting more decided counter-irritation than before.

February 21. Very little inflammatory reaction has followed both this and the first incision, and no recognizable benefit has resulted from the procedure.

By the merest accident I learned to-day, from a person who had been acquainted with the child's parents in earlier years, that both of them had had syphilis before the birth of the child. I made careful inquiries in regard to the ailments and general condition of health of the patient prior to the attack of "croup", but failed to obtain any satisfactory information. From the attending physician, however, I learned that the patient was a pale, delicate babe. He had no serious illness during the first year. When a little over a year old he began to have attacks of vomiting, and at varying intervals they would recur. They began by his emptying his stomach and then he would retch and throw up whatever he took, for three days. They got to expect a three days' siege whenever an attack began. There was no system or regularity about their return. There were no head symptoms nor anything simulating a convulsion. The mother has had one miscarriage and has lost two or three children at an early age. An examination of the child's incisor teeth (not yet the permanent ones) shows no evidences of the characteristic defects described by Hutchinson.

Again the treatment was changed. All attempts at counter-irritation were abandoned, no further applications of silver nitrate were made to the vault of the pharynx, — which, in fact, seemed then to be in so nearly a normal condition as not to require any further active interference, — and the child was put under a regular course of potassic iodide, in slowly increasing doses. It was also suggested that mercurial inunctions should be added, later, to the internal administration of the iodide. My impression is that this part of the treatment was not adopted.

On the 27th of March the attending physician reported that the child was improving, both in his general health and in his hearing power. The iodide of potassium had been given, at first, in five-grain doses, three times a day, but it had been gradually increased, and at that date, the dose had reached seventeen grains, three times a day. The cod-liver oil and compound tincture of cinchona had also been continued. "There is no change," his physician writes, "in the appearance of the external auditory canal that I can discover. The remedy has not yet shown its effect on the skin or in any other way; but the child hears better. Of this I am positive."

I quote again from a letter dated June 11th: "He has taken the iodide regularly since I wrote you last, and is improving quite steadily in respect to his hearing. He took at one time thirty-eight grains, three times a day, but it caused some coryza and he has taken less since. I have not seen him, until to-day, for nearly six weeks. Meantime he has developed a trouble with the left eye, the nature of which I do not understand [? keratitis parenchymatosa]. The chief symptoms are photophobia and watering of the eye. His parents have during this time taken the responsibility of reducing his iodide to seven and a half grains three times a day. I have directed them to increase it again. The child's general health is good. He is growing but not increasing in weight."

In answer to my request for more detailed information in regard to the condition of the hearing, the doctor writes, under date of June 18th: "He hears equally well, as nearly as I can ascertain, with both ears. He would not hear an *ordinary* tone to know what was said. He would hear a tone *slightly* elevated, if the words were spoken slowly and distinctly. His parents think he hears ordinary conversation at times." Again, on the 12th of July, he writes "that one of the child's knees has been in a swollen condition since ten days ago. There has been no pain, however, nor does it hurt him to use it."

Remarks. It seems to me that there can be very little doubt in regard to the syphilitic nature of the lesions which damaged this child's hearing so seriously. The miscarriage experienced by the mother, the loss of two or three of her children in infancy, the selection of the bony parts of the ear by the disease for its first centre of activity, the subsequent development of inflammation of the eye, and then of some sluggish disease of the knee, and, finally, the markedly beneficial effects of potassic iodide administered internally,—all these facts, I believe, favor strongly the idea that the case was one of tardily developed inherited syphilis.

A number of similar cases have been reported by Knapp, of New York (Vol. IX. of the Archives of Otology, where the earlier literature of the subject may be found), by Kipp, of Newark, N. J. (Vol. II. of the Transactions of the American Otological Society), and by others. The chief point of interest in the present case lies in the fact that a circumscribed periosteitis was demonstrable, for a comparatively long period, at symmetrically placed spots in both external auditory canals. These spots corresponded to the bony floors of the mastoid antra. In all other material respects the case differed but little from those hitherto reported.

The discovery of a limited periosteitis (and undoubtedly also osteitis) at the very spot where tubercular disease of the ear is apt to start, suggests the question whether, in cases of deafness due to tardily developed inherited syphilis, this spot, or one very close at hand, be not also a favorite seat of syphilitic lesions.

In view of this possibility I would suggest that particular attention be directed, in cases such as we are considering, to that part of the external auditory canal which lies immediately next to the posterior upper limit of the membrana tympani. I am confident that even a careful observer may, in an unguarded moment, very easily overlook a certain amount of redness of the skin at this point because it is not unusual to find very nearly the same state of things in cases of simple subacute catarrhal inflammation of the middle ear. The distinction between the two, however, may be stated thus: The redness of syphilitic origin is most marked at a spot lying directly upon bone substance, while that due to simple catarrh is most marked along the manubrium mallei and at the periphery of the membrane, and then fades away rapidly from the periphery outward.

While, in the present instance, the administration of the potassic iodide alone, without mercury, appears to have been reasonably successful, I find that a recent writer on this subject* lays considerable stress on the necessity of not trusting to this drug alone, but of employing at the same time, in conjunction with it, mercurial inunctions.

*A. Wolff: *Ueber Syphilis hereditaria tarda.* Volkmann's Sammlung Klinischer Vorträge, No. 273.

NOTE. Sept. 13, 1887. The physician in attendance informs me by letter that the boy now hears almost as well as ever.

A CASE OF DESQUAMATIVE INFLAMMATION OF THE MIDDLE EAR, WITH REMARKS.*

By Oren D. Pomeroy, M. D., *New York, N. Y.*

Bertha F., a German-American, æt. 22, applied for treatment at the New York Polyclinique in February, 1887. She had a chronic suppurative otitis media on the right side which had continued for ten years. The left was formerly in a similar condition, but within two years had become cured, leaving a much cicatrized drum membrane.

The discharge from the right was very offensive indeed. She has occasional pains in the ear with a feeling of heaviness or fullness and occasional smarting. One year since, she noticed small whitish flakey masses coming from the ear which had an extremely offensive smell.

On examination, the canal showed excessive maceration of the epidermis, which had sufficiently collected to narrow the calibre of the meatus. These were easily removed by wiping with the cotton on a holder. The site of the membrane was occupied by a light gray substance resembling the Aspergillus, except there was none of the black peppery look of the Aspergillus nigricans, or any signs exhibiting the peculiar coloration of other varieties of Aspergillus. The condition of the membrane could not be estimated.

This mass was so adherent that it could not be removed at the first sitting, although every reasonable means were employed, such as syringing, wiping with cotton on a holder, attempts to dislodge by means of the bare probe, the use of forceps, etc. On the next visit, twenty-four hours later, the whole of the mass was removed with some

*Read by title.

violence; a red and somewhat bleeding surface was revealed; this consisted of remains of drum membrane agglutinated to the inner wall of the tympanum, some smallish granulations, and swollen mucous lining of the inner wall. The perforation whistle could now be elicited.

Sixteen hours after this thorough removal the membranous mass had reappeared even to a greater extent than in the first instance.

It then occurred to me that it might be a case of Aspergillus and I accordingly had it examined by Dr. J. C. Barnes of the Manhattan Eye and Ear Hospital, who reported it to consist of numerous epithelial cells mixed with cerumen and ebaceous matter, but no signs of Aspergillus. For about a week I instilled a few drops of arg. nit. gr. XL. to the ounce, daily, with thorough removal of the lardaceous material. This returned in considerable quantities each day, and at the end of one week I substituted a 1 gr. sol. of the hyd. bichloride (1 to 500) used in the same manner as the silver nitrate, and in about eight days the desquamations had ceased to make their appearance. It seemed to me that the bichloride had been more efficacious than the arg. nit. The subsequent treatment of the case consisted in cauterization of the granulations with strong nitrate of silver and then filling the canal with boric acid. After several months of treatment there is still some discharge but no granulations, and evidences of considerable reparative action in the drum membrane are apparent. The boric acid remains in the ear nearly one week before becoming moistened; at present this is the only treatment.

In the *diagnosis* of this affection we are of course able to differentiate it from Aspergillus by means of the microscope, but another point occurs to me, to wit: in Aspergillus I have never noticed so offensive an odor as was found in my case; an intense odor of decomposition, something like excessively rotten cheese. The appear-

ances of this lardaceous material, its proneness to return, its adherence to the part beneath, and the bloody look of these parts after the removal of the membrane, were wonderfully like Aspergillus. There was, however, less feeling of inconvenience about the part than in Aspergillus, although some pain was experienced, with a feeling of fullness and smarting somewhat as in the latter affection.

To those desiring to investigate this subject further I might refer them to Buck's Diagnosis and Treatment of Ear Diseases, with the references there found. My own book also has a short topic on this subject, with some references. Turnbull reports cases of desquamative otitis in the Med. & Surg. Report, Phila., May 16th and 23d, 1885. Sexton, in the Med. Rec., N. Y., 18 Apr., 1885, reports a case. Dr. J. O. Green in the Bost. Med. and Surg. Jour. for July 21st, 1881, reports a number of cases with full literature of the subject to date, with extended observations, and Dr. Buck, in the Med. Rec., N. Y., 1877, Vol. XII., pp. 786 to 789, treats the subject very fully.

AN EXAMINATION OF FIFTEEN DEAF MUTES BY MEANS OF J. A. MALONEY'S OTOPHONE.

By C. H. Burnett, M. D., *Philadelphia, Pa.*

On the afternoon of May 27th, 1887, in the presence, and with the kind and most valuable aid of Mr. A. L. E. Crouter, principal of the Pennsylvania Institution for the Deaf and Dumb, in Philadelphia, Mr. Maloney and the writer tested the hearing power in fifteen typical cases classified by the writer as follows:

1st. Five congenital cases.

2d. Five who lost hearing between the ages of 1 and 5.

3d. Five cases of profound hardness of hearing being educated as mutes, but who hear a little, can talk, and understand lip-reading and may be termed semi-mutes.

The method of procedure was as follows: I took the status of each case from the record of the institution, and then kept a record of results while Mr. Maloney, using his method, made the oral tests with an otophone number 3, an instrument designed to determine and develop latent hearing. The five vowels were written and pointed out by Mr. Crouter as they were repeated three times in succession (the object being to give the least time for memorizing and make the test as difficult as possible). The pupil was then told to take the pointer in his or her hand and indicate which one was repeated by Mr. Maloney, care being taken to skip about in the test.

CONGENITAL CASES.

(1.) Nettie S., 11 years old, has a deaf mute sister (see below, case 6). Has been two years in the school, and has learned lip-reading and articulation very creditably. When the vowels were repeated to her, she jumped, said it hurt her, and wept. She seemed to be confused and was excused, partly on account of her youth, from further tests.

(2.) Ida B., aged 21 years. Has a deaf brother. She cannot read the lips. Has been eight years in the institution. The vowels were repeated to her three times in succession by Mr. Maloney through the otophone, first in the right ear. She noticed a difference in the sounds, but could not indicate which vowels were being repeated to her. The left ear was then tested and she indicated O twice correctly and noticed when the ear-piece slipped below the meatus and so informed us. With this case test words were also employed, these being Philadelphia, Mississippi, Burlington, written and then pointed out to the pupil during their repetition, as already noted. She indicated Mississippi and Philadelphia, and then Mississippi again and again, when it recurred in the testing, but failed to get "Burlington".

(3.) Emma R. K., 15 years old; has deaf parents, and a deaf maternal uncle; also a brother a deaf mute in the Institution. She had been four years in the school. She perceived sound by the Maloney instrument, and said after the vowels were repeated to her three times that A and U are different. She indicated correctly A, O, and U, missing of course a number between the successful replies.

(4.) John K. (brother of the previous case), 16 years old, heard sounds in right ear through the tube, but failed to indicate correctly, after the testing by five vowels. Three vowels were then tried, viz.:—A, E, and O. He

said they all sounded alike excepting E, but he indicated correctly O. No result in testing left ear. The word tests were then employed as in the previous case. Successfully indicated "Mississippi" and "Burlington". "Missouri" was now added to the word-tests, and "Missouri" was successfully indicated three times in succession. Of course there were numerous misses, but the successful indications were manifestly not guesses.

(5.) James P., 17 years old, parents both mutes, father a congenital mute, the mother such by acquisition. He has also two congenital mute sisters, a deaf uncle and a deaf aunt. He perceives the sound of the word, Halloa! through the otophone and says it is disagreeable, but does not hurt. The five vowels were first tried in this case, with the left ear. A and O successfully indicated; E mistaken for U and I. The right ear was then tried, and A, I, O, and U, were indicated. The word-tests, the four words already employed, were then repeated to him three times, and they were all correctly indicated. So striking was this result that Mr. Crouter felt that in one who was supposed never to have heard, it must be successful guessing.

(6.) May S., 15 years old, sister of case 1. Has been in the Institution four years. Tried three vowels, A, E, O, three times repeated in the right ear, and then pointed out to her at the same time. She pointed out successfully when repeated, O several times, and A and I mistaken for E. Left ear, A and O a number of times successfully indicated. The word-tests were then employed in the right ear, the four already named being repeated three times in succession. Then when the pupil was requested to indicate what was repeated, she succeeded in indicating Philadelphia, Mississippi, Burlington and Missouri a number of times correctly.

The vowel O was once understood by her as "boy". Boy was then written and repeated to her, being at the

same time pointed out to her, and when given among other test words, it was correctly pointed out by her each time.

ACQUIRED DEAFNESS.

(7.) Mary J. McD. Nineteen years old. No deafness in her family. She became deaf at four years of age, after she had learned to talk; but has since lost the ability to talk. With the right ear does not distinguish the vowels. In the left ear she says they "sound loud". The vowels were then repeated and pointed out to her three times, as already described. She got O several times, then A, I, O. Word-tests, papa, mama, baby, boy, were then employed, and she successfully indicated mama, baby, and papa.

(8.) Annie S., 17 years old, became deaf at four years of age. No deafness in her family. She once spoke German, her mother-tongue. O was perceived correctly by the left ear; she "feels it a little in the right ear".

(9.) Sarah E., 19 years old, became deaf at three years of age; has no deaf relations. The vowels A, I, and O, were first used as tests. She indicated successfully O, A, and I, repeatedly when spoken into the left ear. In the right ear I and O were said to sound alike. O was heard best, I next, and A third.

(10.) George L. H., aged 17 years, became deaf at the age of $3\frac{1}{2}$ years, after he had learned to talk, but since has lost the ability. Has no deaf relations. He says he feels the sound in the left ear. First tested with A, I, and O; all successfully indicated. Then tested by means of A, B, and O. He successfully indicated B, A, several times.

(11.) George G., 18 years old, became deaf from measles at four years of age, after he had learned to talk. Perceives sound "just a little" through the Maloney instrument.

(12.) Harvey DeL., 19 years old; became deaf at the age of five years from spotted fever. He perceives a little through the right ear.

(13.) Oliver E., 18 years old; became deaf from a catarrh at six years of age. Can speak. In the right ear "feels" the vowels a little. Indicated correctly three times A and I. No word-tests like those previously used were employed, as the results with the vowels, in the cases of acquired deafness, were not as good as in the so-called congenital cases: a curious fact, but one not at present accounted for, unless it be because the process productive of the acquired form is more violent (involving the internal ear, as in spotted fever) than in the congenital cases, which are due to ordinary chronic catarrhal processes, similar to those occurring later in life, in other individuals.

SEMI-MUTES.

Tests were made in the cases of two boys with acquired deafness and instructed like mutes, but still able to talk and to hear some.

(14.) Benj. G., 17 years old; became very deaf at nine years of age, probably from a purulent process, as indicated by the membrana tympani. This boy heard everything said to him through the otophone by Mr. Maloney and returned intelligent articulate answers to all the questions.

(15.) Thos. O'B., aged 18 years: became deaf at the age of four years from spotted fever. He hears very well by means of the otophone. The articulation in such cases could without doubt be greatly improved by the use of such an instrument, if its employment as a means of instruction could be begun early in life. Also the function of hearing could be better retained and perhaps improved by the normal exercise it would obtain by hearing through a Maloney otophone.

AN EXAMINATION OF DEAF MUTES BY MEANS OF J. A. MALONEY'S OTOPHONE.[1]

By Francis B. Loring, M. D., *Washington, D. C.*

Some few months since my attention was called by a patient to the otophone devised by Mr. Maloney, and finding that the improvement in this case was more than marked, I determined to investigate his invention in order to see by a series of experiments if the result in the case referred to was a "happy accident", or whether something had been accomplished by Mr. Maloney which would be a help to us in those cases that are generally designated in our case books as hopeless. Shortly after this I received a letter from Dr. C. H. Burnett, of Philadelphia, stating that he was going to examine fifteen typical cases in the Pennsylvania Institution for the Deaf and Dumb, classified by him as

"1st. Five congenital cases.

"2d. Five who lost hearing between the ages of 1 and 5.

"3d. Five cases of profound hardness of hearing being educated as mutes, but who can hear a little, can talk and understand lip-reading and may be termed semi-mutes."

It was agreed that I should make a similar examination at the National Deaf Mute College at Kendall Green, and this was done, on three successive occasions, by Mr. Maloney and myself, with the kind assistance of Mr. John Wight, the supervisor of the Institution, and in the presence of Dr. Gallaudet and Professors Gordon, Denison and Ballard. The tests were made by Mr. Maloney

[1]Read by title.

with an otophone number 3, which is the one particularly adapted to the determination and development of latent hearing. The method used was to write five vowels on a piece of paper which was placed in the hands of the person being examined, then the particular vowel, spoken through the otophone by Mr. Maloney, was pointed out by Mr. Wight. This was repeated three times in order to impress the different sounds of the letters upon the ear, the subject being then required to point to the vowel given, two consecutive ones at no time being used. Words were also written in the same way, viz.: "Mississippi," "Baltimore" and "New York". The number of vowels in some cases was however reduced to three — as five were found to be too many to be carried in the memory of the deaf and dumb — as it must be borne in mind that names and letters convey no impression to the deaf mute, and that he is not by any means on the same footing as a "hearing person" (as they themselves express it) who has become deaf late in life. In other words, his ear may recognize distinctly the different sounds as given through the otophone, while his memory, entirely unpracticed as regards sound, may not be able to refer it correctly to the vowel indicated.

The tabulated result of the fifteen cases was as follows:

CLASS I. CONGENITAL.

W. A. — Age 17, distinguishes five vowels correctly after they have been repeated four times.

Mr. S. — Age 23, distinguishes all vowels.

Mr. O. — Age 16, repeats three vowels; can not carry five; also distinguishes between "Mississippi" and "Baltimore".

L. S. — 10 years, no improvement and complains of pain.

Mr. T. — Age 24, can recognize three vowels.

CLASS II. WHO LOST HEARING BETWEEN AGES OF 1 AND 5.

Mr. H. — 21 years. Lost hearing from scarlet fever at 5 years. Hears all vowels.

Mr. H. — 19 years. Lost hearing at eleven months. Hears and repeats all vowels, also three words.

Miss A. W. — 14 years. Lost hearing from scarlet fever at three months; gets A, O, and I.

N. L. — Age 23. Hearing lost from brain fever at two years; no improvement; no conduction either aerial or bone.

Mr. R. — Age 19. Spinal meningitis at five years. Hears and repeats four vowels out of five, also "Boston" and "Mississippi". Can not distinguish between "Baltimore" and "Boston".

CLASS III. SEMI-MUTES.

Mr. D. — 40 years. Deaf on one side to such an extent that no sound could be distinguished. On the other could converse with trumpet. This condition had existed for over 35 years. With otophone, hears conversation easily with worst ear, and with best one the instrument can be removed for at least four inches from contact with concha.

Case number 2 in this class is a curious one; he has been educated as a deaf mute and uses the sign language entirely, making his replies verbally, speaks naturally, and is an expert lip-reader. With the otophone, however, he understands conversation perfectly, with either ear.

Mr. K. — Age 29. An expert lip-reader; can hear some sounds, but the otophone does not seem to improve.

Mr. H. — Has a natural voice, lost his hearing from scarlet fever at five years, is now 29. Hears all the vowels and is doubtless capable of much improvement.

In regard to the younger pupils at the Institution a care-

ful and prolonged examination has been made with the assistance of Miss Gordon, the teacher of lip-reading. The details of this are, however, too voluminous to come within the scope of the present paper; but from the brilliant results attained in a great number of cases, I have no hesitation in saying that in her patient and painstaking hands the instrument will be of the greatest service.

DISCUSSION.

Dr. Seely:—I would ask if this instrument is intended simply as an aid to the hearing or is it to be used as a therapeutic measure?

Dr. Burnett:—As I have observed the results in some very deaf people, I may say that it is not only an immediate help in hearing but it is also a good therapeutic measure. I have examined one very deaf man who, I believe, does not hear at all through the ordinary ear trumpet. I believe that what he appears to hear is obtained by lip-reading. He came to my office to try one of these instruments. When he came into the office he heard absolutely nothing when the mouth was placed near the ear. He heard very imperfectly through the ordinary tin tube which he had in his hand. We then tried the otophone and he immediately heard fairly well. After exercising with this for fifteen or twenty minutes he heard, with his eyes closed, the unaided voice when the mouth was at least a foot from the ear. This person is entirely beyond self-deception. After the ossicles had been thus passively moved to a certain extent, he certainly heard the voice a foot from the ear. Dr. Bryan's case showed the same thing. He found so much benefit that he over-used the auditory apparatus. I believe that as a therapeutic agent, it is as good as any other form of passive motion, to overcome anchylosis.

Dr. Capron:—I would ask if it has been noted that

the use of the instrument had any effect upon the tinnitus aurium?

Dr. Burnett:—I cannot answer that question as clearly as might be desired. The gentleman already referred to, said that the strain of trying to hear through the tube was entirely gone. I do not think that he suffered greatly from ordinary tinnitus aurium. He, however, dwelt upon this point of strain. He said, "What I heard before, I had to go after, but here the sound comes to me in a natural way". He has had a larger instrument made and is able to hear what is addressed to him by a person six feet away, and his whole life has been brightened by it.

In another case of profound deafness in a lady in Chicago, I learn that she uses the instrument with great comfort. With the ordinary trumpets she seemed to hear no better than without. The ears are said to be more comfortable since using an otophone, and as she had constant tinnitus aurium, I suppose she hears less of the subjective noise than formerly.

EXCISION OF THE OSSICLES OF THE DRUM OF THE EAR FOR THE CURE OF CHRONIC PURULENT INFLAMMATION OF THE MIDDLE EAR TRACT.

By Samuel Sexton, M. D., *New York, N. Y.*

Since bringing this operation for the cure of purulent inflammation of the middle ear tract and its results to the notice of the Society a year ago, the writer has continued its practice with even more satisfactory results than were then anticipated, and, believing the matter to be of general interest, he begs to present on this occasion some further observations on the subject. These are for the most part based upon the records of nineteen cases. Thirteen of these were females and six were males.

In respect to *age*:

Seven were between 5 and 12 years of age.
Eight " " 13 " 20 " "
Four " " 23 " 40 " "

The left ear was operated in eleven cases, the right ear in seven, and both ears in one. In two of the cases both ears were suppurating: in one case the presence of a cicatrix behind the auricle confirmed the patient's statement that there had been a mastoid abscess.

In reviewing the *conditions* under which this operation was undertaken, it is found that in the great majority of the cases a very offensive discharge had long existed, together with a history of frequent "gathering and breaking" in the ear, often with invasions of acute head catarrh where swelling of the drum gave rise to obstruction to drainage from the attic and antrum, the attacks being attended with

severe pains in the ear. Usually the patients were very deaf and experienced distressing acoustic phenomena, as autophony and noises in the head and ears.

The *general health* of the patients was not good: most of them were from the run down class found in hospital practice. The young children were generally nervous, peevish, cachectic and poor sleepers, whilst the older ones were neuræsthenic and subject to neuralgia about the head.

The pathological state of the drum in all cases was one of irremediable impairment of the transmitting mechanism.

The existence of chronic purulent inflammation of the attic and antrum with sinus leading out through the upper margin of drum head, where discharge and deafness are slight, does not generally call for excision of the ossicles. But chronic purulency of these parts that has resisted other methods of treatment for months or years, together with loss of the greater portion of the membrana vibrans and consequent deafness, are conditions that the operation will nearly always relieve and generally cure so far as the otorrhœa is concerned.

In most of the cases under discussion the membrana flaccida was almost the only portion of the drum head remaining. In some cases, however, bands consisting in part of the remains of the m. vibrans and in part of cicatricial tissue, were found extending in various directions from the tympanic ring, m. flaccida and malleus, binding the dismantled transmitting apparatus to the inner wall of the tympanum. In the larger number of cases the remains of the ossicles and cicatricial structures just alluded to were found adhering to the inner wall of the drum in such a way as to prevent drainage from the attic and antrum during "gatherings", though the small sinus usually present was sufficient for the escape of the ordinary secretion of these parts.

The malleus and stapes were generally found present, being firmly held in place by ligamentous and membranous attachments. The incus was less constantly found and its attachment to the stapes seldom remained.

The malleus, or portions of it, was usually found quite firmly held in the drum, even after the most destructive or long continued suppurative action.

The tympanum was sometimes almost filled with granulation tissue or polypoid growths of greater or less size, and the mucous membrane lining the parts was often greatly thickened. Secretions were very abundant where such pathological conditions also existed in the antrum and neighboring cellules, specially when these deep lying cavities were large.

In some of the cases the drum head was the seat of a large heart-shaped perforation, leaving a narrow rim attached to the tympanic ring all around; in others the malleus handle had been partly destroyed by caries, a stump only remaining which was in some instances denuded, in others enveloped in thickened tissues. Sometimes the handle was covered with white and glistening cicatricial tissue. The incus was also more or less affected by caries in most cases.

The articular surfaces of the ossicles were generally abnormal; very often anchylosed to each other. In several of the specimens exhibited, the malleus and incus are thus attached. The incus seemed adherent to the scute in some cases — though a doubt was entertained in respect to these as to whether this bone might not have been absent, the parts being beyond the range of vision and explored by means of a probe, which, in touching the exposed and roughened surface of the scute, gave a rather uncertain impression. In one case the neck of the malleus was adherent to the auditory plate. The walls of the middle ear tract were seldom entirely free from caries, especially the floor of the attic.

A peculiarity of the denuded surfaces in this region is the white and glistening appearance of the cicatricial tissue which is substituted for the periosteal surface when healing has taken place.

The condition of the stapes cannot always be determined, since it is impossible to examine it in situ in all cases; it is, however, probably very often much injured.

The operation was done under ether narcosis, the patient lying with the back upon a table constructed so that the head and body could be raised to a convenient angle. The electric light is almost an essential, since the best possible illumination is required whilst at work in the middle ear. The existence of a narrow and much curved external auditory canal interferes very much with operative procedures. Where granulation tissue or polypi occupy the drum they should be removed previous to the operation by treatment, since less bleeding will occur and the parts can be much better seen. The first step in the operation consists in detaching every remaining fragment of the drum head from the tympanic ring by means of an incision made with the slender trowel-shaped knife hitherto described. At this time, or before, the incudo-stapedial articulation is, if intact, to be divided with a small angular-bladed knife. The malleus is then freed from its attachments, including the tendon of the tensor tympani muscle, as well as all tendinous connections. After cleaning the parts of the blood, which flows at first quite freely in most cases, with tampons of cotton wool kept ready for use, this bone is seized with stout dressing or foreign body forceps as high up as possible and by gentle traction is gradually brought away. The long process of the incus is now sought and in cases where its stapedial attachment has remained it usually hangs down in situ. But where it has long been separated from the stapes its removal is by no means always easy, since the long process may be

absent, or, if remaining, the entire bone is liable to be swept from view and to find a lodgment upon the scute behind the margin of the tympanic ring or to become displaced backwards towards the antrum. I am in the habit of searching for this bone, when concealed from view, with a bent probe, using from time to time a magnifying glass to bring the whole region into better view. Its removal is not difficult when once its whereabouts are discovered. When brought down with a bent silver probe or the attic-scraper it may easily be brought away with forceps.

In some instances I no longer divide the chorda tympani nerve when present as a preliminary step in excision, finding, as a result of experience, that the ossicles may often be detached without wounding it.

Experience has enabled me to very much lessen the time at first required to perform the operation. At first the patients were often kept under the narcotic for an hour, whilst in the later ones the operation itself did not occupy more than ten or fifteen minutes. To the protracted ether narcosis in the former may be attributed protracted nausea with more or less prostration lasting, in some instances, for a day or two, symptoms not observed in the late operations. It is best to avoid operating during the menstrual period. Syringing with hot water was seldom resorted to for the removal of blood from the fundus during the operations, cleansing with absorbent wool being sufficient.

After the operation the drum was always dried with wool, and usually a few drops of 4% solution of cocaine instilled. There is seldom any pain experienced after the operation, and cocaine is not always necessary. Generally very little inflammatory reaction followed the operation, though some infiltration of the parts may be expected.

Of the nineteen cases both malleus and incus were removed in ten cases; in one case the body of the incus only

remained, and it was removed; in one case the head and neck of the malleus only remained and were removed. In one case the ossicles were too firmly attached to the walls of the attic to permit removal of both of them without undue force. In six cases the malleus only was excised. (During my early experience the operation having been more protracted than later on, there was much more hemorrhage which served in part to conceal the incus. Moreover, I believe this bone to have been absent in some of the cases where the malleus only was found.)

Where caries of the osseous structure of the middle ear tract exists, or where a large pathological cavity comprising the attic, antrum, and cellules is lined with an actively secreting surface, the treatment must be directed to keeping down granulation tissue whilst the transformation of the mucous lining to a dermoid condition takes place. In some very much run down persons all treatment may, for a time at least, prove unavailing, but "gatherings" no longer occur, since drainage is no longer interfered with. In one case, under most unfavorable conditions, whilst drainage remained good, purulency continued and granulation tissue refilled the attic in a short time after the operation. Some bands, moreover, subsequently were found to connect the tissues on the upper margin of the tympanic ring with the inner wall of the tympanum.

Active measures should be avoided at first, but later on salicylic or boracic acid powder may be employed. The peroxide of hydrogen has its use in some cases. Alcohol has not been found useful in keeping down granulation tissue in these cases. The persistency of discharge after the operation usually depends upon a general catarrhal condition of the upper air tract in cachectic subjects, especially where caries of the bone exists. In such cases general treatment must not be overlooked.

Where extensive adhesions and greatly thickened tissues

were cut away the discharge immediately increased for a time and there was some tenderness of the tissues for several days. Generally the discharge gradually decreased and then ceased altogether, leaving a non-secreting, dermoid surface lining the entire middle ear tract as far as could be seen.

Of the nineteen cases the result was as follows:

In 5 cases a cure took place in less than one month:
In 2 " " " " " two months;
In 2 " " " " " three months;
In 1 " " " " " six months;
In 5 " still under observation, there is slight improvement;
In 3[1] cases still under observation, there is no improvement;
In 1 case the treatment was not continued.

A marked improvement in hearing occurred in consequence of the operation in most of the cases; thus in a case where no conversation could be discerned in any tone, loud voice at five feet could afterwards be heard; in another where loud voice only could be heard at ten feet, low voice could afterwards be heard at the same distance; one who heard loud voice only at twenty feet could afterwards hear a low tone of voice the same distance. Two heard loud voice previous to the operation, and ordinary voice afterwards, at five feet. One who heard ordinary voice only at five feet, could hear the same tone of voice after the operation at fifteen feet. One heard ordinary voice at five feet, and afterwards low voice at three feet. One heard ordinary voice before and low after, at twenty feet. One, ordinary voice before and low after, at ten feet. Taking

[1] In two of these cases suppurative inflammation seemed to continue in one because of caries of the scute, and in the other in consequence of the retention of the incus, which could not be found.

the ten cases rated as *cured* it may be fairly estimated that the gain in hearing power was from 75 to 100 *per cent.*, as tested by the voice. It was improved for the watch and other high pitched sounds also. In two cases hearing was unimproved. The hearing power was not always notably increased immediately after the operation, but improved gradually as a cure was established.

This marked improvement in hearing was quite unexpected by me, and has given rise to the conviction that the operation may be recommended for deafness alone in many cases where the drum is obstructed by the results of chronic purulent inflammation, though all discharge may have ceased. Such an operation would, if successful, be a boon to deaf mutes especially, many of whom are deaf from this cause.[1]

It would naturally be expected that the *sense of taste* would be affected, were the chorda tympani nerve injured. In many of these cases the nerve had been, probably, previously destroyed by purulent inflammation, but in a few instances where it doubtless remained and was divided the sense of taste was for a short time disturbed. Recovery, however, always took place in a short time.

The important results of excision of the remains of the transmitting mechanism of the ear are the prevention of recurrent accumulations of mucous or purulent matter in the attic and antrum, the cure of otorrhœa together with the relief of the attendant pain, deafness, and distressing acoustic phenomena.

Reproduction of the drum head did not take place in any of the cases.

General health was nearly always much improved; in two phthisical subjects the cough lessened in one and ceased altogether in the other, whilst both gained much in strength and weight.

[1] The writer has since operated successfully on such subjects.

In children the good effect on health was very marked: anorexia, restlessness, febrile movements, etc., which previously existed, ceased after the operation. Indeed, this would be expected on the cessation of otorrhœa and earache. The diseased ossicles removed are herewith presented.

DISCUSSION.

Dr. Gruening:—This is essentially Schwartze's operation. He has done it frequently and given a series of cases in his treatise. Dr. Sexton differs in one particular. He dwells on the importance of removing the incus. Schwartze does not insist upon that. He removes the hammer and the membrane. Schwartze cannot prevent the reproduction of the membrane. The indications of Schwartze for performing this operation are different from those of Dr. Sexton. While Dr. Sexton performs almost the same operation, his results are not like those of Schwartze.

Dr. Burnett:—I have had the pleasure of seeing seven of Dr. Sexton's cases after operation. I regret that I did not see them before operation so as to be in a position to compare their subsequent condition with that which had previously existed. One of the cases had been operated on one year and three months before I saw it. There was no reproduction of the membrane. One can look into the cavity of the tympanum in the case and see the promontory and round window with the stapes in position. This can be more distinctly seen by the use of a magnifying glass. In the cases operated on subsequently there has been no reproduction of the membrane. In one case there seemed to be a little peripheral reproduction which had fallen in and become adherent to the lower part of the promontory.

There was no secretion in the cases which had been operated on the longest. In two of the more recent cases there was still a little secretion, but in all the others the discharge had entirely ceased.

The indications for the operation are the cure of the discharge and the improvement of hearing. As Dr. Sexton has stated, the improvement in hearing was in a measure an afterthought. As a matter of fact, in five of these seven cases the hearing was very good in the previously affected ear. The patients were able to earn a livelihood where they were unable to do so before. They were unanimous in the statement that the hearing had been greatly improved. I wish that some of the other members of the Society could see the operation and the results, and they would then be better able to understand how Dr. Sexton feels.

I look upon the operation of Dr. Sexton as different from that of Schwartze. He took out the malleus, which is a comparatively simple operation. The removal of the incus seems to be very important. I have not tried the operation myself but I believe that it is worthy of consideration.

A CASE OF SYPHILITIC DISEASE OF THE LABYRINTH, EXHIBITING REMARKABLE VARIATIONS IN THE DEGREE OF DEAFNESS.

By Samuel Theobald, M. D., *Baltimore, Md.*

Mr. X., about 30 years of age, a retail merchant, was first seen by me Oct. 2, 1886. He denied that he had ever contracted syphilis, but believed that he had inherited it, and had been told that this was the cause of the severe irido-keratitis which had destroyed the sight of one of his eyes some time before. His family history, as well as his physiognomy and teeth, although the latter were not quite typical, confirmed this view of the case. He sought my advice on account of the state of his hearing. He was almost absolutely deaf in his left ear, the watch not being heard at all with this ear, and words being distinguished with difficulty when spoken in a loud voice at 2′. With the right ear he could hear the watch upon light contact, and could distinguish some words in an ordinary, and others only in a loud voice, at 20′. The tuning-fork was felt, rather than heard, by bone conduction. The auditory canals were dry and the left tympanic membrane was hyperæmic. The use of the Polizer bag made no change in the hearing. My diagnosis was syphilitic disease of the labyrinth, most advanced in the left ear, with, as is usual in severe cases of this character, some accompanying involvement of the middle ear. The case had previously been under the professional care of Dr. Gruening, in New York. The treatment instituted was, $\frac{1}{32}$ gr. hydrarg. biniodide, with pot. iodide gr. ii to be taken three times a day, and the use of a gargle containing tinct. of iodine,

and iodide of potassium. At the end of a week, there was slight improvement in the hearing for words, and the tuning-fork, placed on the head, was heard by the right ear. The dose of hydrarg. biniodide was then increased to gr. $\frac{1}{24}$, ter die. Oct. 21st, the hearing was hardly as good, and both tympanic membranes, especially the left, were hyperæmic. Discontinued the biniodide of mercury and potash, and prescribed instead hydrarg. bichlorid. gr. $\frac{1}{24}$ with ammoniæ muriatis gr. x. ter die. Nov. 21st, he reported that his hearing had been much better for several weeks, the treatment having been kept up in the meantime. With the right ear he could now hear the watch at 2″ and could distinguish words and understand questions, spoken in a whisper, at 20′. The left ear was not materially improved, although it could distinguish words in a loud voice with difficulty at 20′.

Jan. 23, 1887, he reported that he had kept up the treatment with regularity, but that suddenly, two days before, his hearing had left him: and I found upon testing it that it was quite as bad as when I first saw him. With his better ear (L) he could now distinguish some words in an ordinary, and others only in a loud voice, at 20′, while the right ear could distinguish words with difficulty in a loud voice at 5′. He told me he had had a similar attack about Christmas time, which, however, had passed off after a few days. He was instructed to continue the mercury and ammonia, and the iodine gargle, and, in addition, to apply behind and around the ears at night a 20 % solution of hydrarg. oleat.

March 3d, he reported having discontinued the treatment, and that his hearing for some time had been excellent. The hearing now was, right ear, watch 5″, words and questions in whisper at 20′, with normal acuteness: left ear, watch not heard on contact, words in ordinary and loud voice at 20′. There was, however, a decided

hyperæmia of the right membrana tympani and of the roof of the deeper portion of the meatus. I, therefore, directed him to resume the treatment last prescribed. March 11th, I found the right ear free from hyperæmia; but his hearing had again become so bad that it was necessary to approach this ear, and speak in a loud voice, in order to make him understand what one wished to say to him. This sudden loss of hearing he told me had occurred since the previous day. He was directed to keep his bowels open with compound cathartic pills, and to continue his remedies. April 16th, right ear heard words in a loud voice at 20′. His hearing had been much better, he said, since he had seen me, but had been worse again since the previous day. The dose of hydrarg. bichloride was increased to $\frac{1}{16}$ gr. ter die. June 2d, another relapse induced him to call upon me. Soon after his last visit (April 16th) his hearing had again become as good as usual, and he had discontinued the larger, and resumed the smaller doses of hydrarg. bichloride. He was instructed to take again the larger doses. June 11th, he made a similar report. He had been much better until the day before, when his hearing had once more declined. He was, however, still able to distinguish some words in a whisper and others in a low voice at 20′, and to hear the tuning-fork by bone conduction. The mercury and ammonia were now discontinued, and a saturated solution of iodide of potassium prescribed. Of this he was to take at first five drops three times a day, and each day was to increase the dose by one drop. June 17th, he had reached twelve drop doses, but there was no improvement in his hearing. In fact, it was not as good as at the last visit. He was, therefore, directed to increase the dose of iodide more rapidly, by two or three drops each day, if no unpleasant effect resulted. June 20th, he was still no better, and the twenty-two grain doses of iodide, which he had reached, were beginning to produce

headache and pain in the region of the frontal sinus. Right ear distinguished some words in an ordinary and others only in a loud voice at 20′. Stopped the iodide of potassium, and ordered him to resume the bichloride of mercury (gr. $\frac{1}{16}$) and muriate of ammonia (gr. 10), taking four doses a day. July 15th, he called at my office, in response to a note requesting him to do so, in order that I might bring this report of his case down to as late a date as possible. His hearing had again greatly improved. Within a few days after resuming the mercury and ammonia the change, he said, had taken place, and he had then dropped to three doses a day, instead of four. At this last visit, the hearing was as follows: Right ear, w. $2\frac{1}{2}$″, words and questions in a whisper at 20′, with nearly normal acuteness. Tuning-fork on vertex or forehead heard only in right ear, and when not vibrating strongly it was unperceived by either ear. The hearing of the left ear had undergone no appreciable change.

The sudden and very marked variations in the hearing power constitute the interesting feature of this case. I do not recall another, in my experience, which equalled it in this respect.

DISCUSSION.

Dr. Gruening:—I remember this case. This patient had been under my treatment for several months and he had the same relapses and exacerbations as well as periods of improvement. I treated him with mercury and iodide of potassium and also by the introduction of the catheter. After inflation of the ear there was generally immediate improvement of hearing. I think that when I discharged him his hearing was about as Dr. Theobald stated.

Dr. Noyes:—In Dr. Theobald's case, might not the lesion have been more in the middle ear than in the labyrinth and this explain the variations in the hearing power?

Dr. Theobald :— I have no doubt that there was trouble in the middle ear, but I regarded that as of minor importance as compared with the condition of the labyrinth. I relied chiefly on the tuning-fork in making the diagnosis. The tuning-fork was at first not heard at all on the vertex or forehead. There was merely a sense of trembling. I think that if the degree of deafness which he exhibited had been due to middle ear disease, the tuning-fork would have been heard distinctly by bone conduction. There was no collapse of the membrane and no benefit was derived from the use of the Politzer bag. He was himself able to inflate the ears by the Valsalva method. I think that all the tests pointed strongly to the view that the labyrinth was the part chiefly involved.

Dr. Agnew :—I think that the author said that the drum head was red. Would it have been worth while to have tried local depletion under these circumstances where the pathological changes were evidently in the cavity of the drum as well as in the labyrinth and the drum head showed special signs of local hyperæmia? The plan of placing a little cotton in the external canal and then scratching the anterior wall of the canal at the base of the tragus to start the bleeding at the point where it is desired to have the leech bite, and applying the leech as far in as possible, and following this up by the use of warm water, might have given the benefit of local depletion of the parts. I think that I have seen positive good effects in several such cases by applying leeches in this way and by the use of the Turkish bath. I would venture to suggest that for these recurrences of transient deafness, it would be well to pursue some active measures with reference to the middle ear inflammation, lest the proliferative changes ultimately sink both ears into irremediable deafness.

Dr. Seely :—I would ask Dr. Theobald whether he thinks that treatment had any influence upon the course of

the case? The relapses seem to have occurred about the same when the patient was under treatment as when he was without treatment.

Dr. Theobald: — I have not had much experience in the local abstraction of blood in such cases as this, but I can imagine that it might be of service. I have never applied leeches inside the canal, and I have had no experience with the Turkish bath.

In regard to Dr. Seely's question, it is impossible to reply with certainty. I think that one of the strongest evidences of the benefit of the treatment adopted was the behavior of the case during the last few weeks of its history. Finding that the relapses occurred so frequently and that mercury was not of permanent benefit, I put the patient upon the iodide of potassium. There was no improvement, but on the contrary he became worse and complained of the effects of the iodide. I then gave him more liberal doses of the bichloride of mercury in combination with muriate of ammonia, and in two or three days a decided change for the better took place. I think this is good evidence that the bichloride and muriate of ammonia were of service.

VERBAL COMMUNICATIONS.

AN EFFICIENT POWDER BLOWER, WITH REMARKS ON THE USE OF POWDERS IN THE TREATMENT OF DISEASES OF THE EAR.

By E. E. Holt, M. D., *Portland, Me.*

The powder blower which is here presented to the Society is one made by attaching about fifteen inches of rubber tubing to the smallest size of the ordinary glass tube sold by apothecaries for taking medicine.

The straight tube accomplishes the object admirably, but when placed in the hands of the patient one bent at an obtuse angle will be found more efficient.

The free end of the glass tube is plunged into the powder, a depth according to the amount of powder desired to be used, then the rubber tube is placed in the mouth and the powder gently drawn up to the proximal end; the distal end is then placed in the speculum and the powder blown into the ear. By drawing the powder up from the distal end of the glass tube to its proximal end and blowing it out, it is carried *en masse* to the desired point and applied evenly to all parts.

But very little practice is required to do this readily and without accident.

The advantages of this form of powder blower are:

It can be obtained of the apothecaries at any time.

It costs but a trifle.

It can easily be kept clean and ready for use.

It can be used with great facility and the amount of powder can be seen and readily measured.

In regard to the efficacy of powders in diseases of the ear with a discharge from the meatus, there is probably no difference of opinion when the cases are duly selected and the powder properly applied. After trying the various kinds of powders, boric acid has been found to be the most efficient in the largest number of cases. Among the first cases in which it was used, one is well remembered, since constant treatment for over two years had failed to cure the suppurative otitis media, when, upon the application of powdered boric acid, the discharge ceased and has not recurred, a period of over five years.

Of course absolute cleanliness is essential before using the powder, a point too often overlooked by the practitioner.

The practice of filling the ear with boric acid powder before the parts involved have had time to drain off through the perforation in the drum head can only retard resolution, and should be classed under "meddlesome treatment". Careful observation of cases of chronic suppurative otitis media treated according to indications, but principally with boric acid, with those treated previous to the introduction of this drug, which were similar in their origin, course and environment, would lead me to the conclusion that although the discharge from the ear ceases much earlier with the use of the powder, yet perforations in the drum head heal less frequently.

DISCUSSION.

Dr. Theobald: — I beg to exhibit a powder blower which resembles that of Dr. Holt. It consists of a rubber tube with a quill at each end. One quill is intended for a mouth piece, while the other holds the powder. The mouth piece is shorter than the piece for the powder, so

that a mistake will not be made. The quill has advantages over the glass tube. It is not so liable to break. The quill is thinner than the glass and therefore the calibre of the tube is greater. After placing the powder in the quill, it is transferred to the tube by shaking. It is then blown into the ear in the form of a cloud and reaches the bottom of the ear. The transparent quill enables one to see how much powder has been placed in the tube.

Dr. Seely: — I used to blow powders into the ear, but I have not done so for some years. If I were to blow powders into the ear, it would simply be to start it and then pack the ear full. I never saw any benefit from simply blowing powders into the ear. I never saw benefit except from packing. I have not seen perforations of the membrane heal, except where (that is, in the boric acid treatment) the meatus has been closely packed, where there was enough powder to absorb the moisture and still leave sufficient to close the external canal.

Dr. Roosa: — Why does Dr. Seely not use the powder?

Dr. Seely: — Because I do not get good results. For some reason we get better results with a new process at first than we do later on. It has been the same with internal division of strictures of the nasal duct. I obtained some good results with boric acid at first.

In the treatment of these cases of suppuration there are three indications. The Eustachian tube should be kept free, the naso-pharynx should be treated as in any other case of inflammation of the middle ear, and the ear should be kept clean by the use of the cotton and probe. I think that this practically constitutes the treatment of this class of cases. The patient can be instructed in the use of the cotton and probe better than in the use of any other measure for cleansing the ear and is less liable to do himself harm.

Dr. Prout: — The great advantage in the use of pow-

ders is that the ear is kept as dry as possible. Gentle wiping away of the pus with absorbent cotton is sufficient cleansing in ordinary cases. Boric acid blown in, not packed down, maintains the dryness and in addition prevents decomposition of the secretions with the resulting irritation of the parts, thus encouraging the natural tendency to heal. The surface of an ulcer may be kept so clean that its healing is delayed. The use of the syringe and ear drops may have a similar effect.

Dr. Roosa: — I was much interested in the remarks of Dr. Seely, and also in what Dr. Gruening said in the New York Ophthalmological Society with reference to the danger from the use of powders. I cannot conceive of such a condition as keeping a part too clean, although I am not an advocate of the unreserved use of the syringe. It is to me the best means of cleaning the ear. I use powders with great circumspection. With reference to powder blowers, I like that of Dr. Knapp better than any other. We should advise a great deal of caution in the use of powders. This plan of treatment is much inferior to other methods, and only in exceptional cases is the use of powders better than other plans of treatment.

Dr. Sutphen: — I would ask if any gentleman present has seen bad results from dusting boric acid into the ear without packing the canal?

Dr. Randall: — I have never packed the canal, but I have used the powder blower with greatest satisfaction, especially in *chronic* cases. I have within the last two months seen no less than a dozen cases of distinct purulent discharge, generally very fetid. There has been a duration of from five to fifteen years of pretty continuous purulent and very fetid discharge. I have cleansed these ears and then used powder by insufflation, not packing the canal but getting in a good supply. I begin with a light dust and finally close the canal pretty well without packing it.

Within a few days, I generally find that the powder has dissolved and that the discharge, if it has not ceased, is much less in quantity and has lost its fetid odor. Having had such results in eight out of ten cases, I have not been disposed to give up this method. If better results are obtained by any other plan I should like to hear it. I should like to know if any of the members have met with an instance where trouble was caused by the use of boracic acid insufflated or dusted into the ear, or if any have met with cases where boracic acid *packed* into the canal gave rise to trouble. Trouble has followed the use of iodoform.

Dr. Knapp:—With regard to the efficiency of boric acid powder, this remedy seems to follow the general rule, namely, to act well only as long as it is fashionable. I cannot say that I have had any ill effect from boric acid. I use boracic acid powder in acute cases of otorrhœa as an antiseptic, cleansing the ear with a syringe three times a day. After the cleansing I have the ear more or less filled with the powder, which is introduced with a scoop. I tell the patient that as soon as the powder gets moist, the ear must be cleansed again with the syringe and the powder renewed. The majority of acute cases requires no other treatment. In chronic cases, if there are polypoid growths or carious bone, these must be removed. I then use alcohol fifty or sixty per cent. or absolute strength with sulpho-carbolate of zinc one-half per cent., and change this with nitrate of silver. The change is necessary every three or four weeks. I continue this treatment until the discharge is completely stopped, and the ear remains dry. As soon as this point is reached, I tell the patient to use nothing except a cotton plug to filter the air, and I leave perforations alone. We all know that sometimes we dismiss a patient with an enormous defect in the drum head and that six months later he returns with a perfect drum. In one case, I make an exception to this

rule, and that is, when a perforation of moderate size has perfectly clean edges and for weeks or months remains unchanged. Under these circumstances, I paste Dr. Blake's little piece of sized paper over the perforation. In many cases the hearing is improved. This paper has to be replaced in a number of days or weeks. Its use seems to have a tendency to favor the healing of the perforation. If there is any discharge left or sets in again, the paper will be thrown out.

With regard to "Knapp's powder blower", I want to say that, years ago, I asked Mr. Tiemann to make me a powder blower like the one used by the laryngologists, only neater and with dimensions adapted to the ear. I thought the changes which I ordered so unessential that I neither said or wrote a word about them. Some time afterward I learned that the little instrument had been admitted to the catalogue and had quite a sale under the name of Dr. Knapp's blower.

Dr. Agnew: — A great point in treating these suppurative cases is to treat cases according to their peculiarities. We should apply the ordinary methods of surgical procedure. It may be occasionally by the dusting of powders, if the opening in the middle ear is sufficient and the appearance of the mucous membrane would indicate that good might be expected from a detergent and astringent powder lying in contact with the juicy and somewhat granular membrane. In other cases alcohol might be indicated, and so on.

I have a little manœuvre in the use of fluid applications which, however, may not prove to be original with me. After having cleaned an ear, in which I wish to diffuse a fluid application as much as possible, I turn the affected ear uppermost and fill the auditory canal with the solution. I then insert the nozzle of the Politzer apparatus into the external auditory canal and make pressure. This causes

the liquid to diffuse itself and sometimes to appear in the nostril through the Eustachian tube.

I am quite convinced from this discussion that the great point is not to become enamored with any one exclusive method of treating this class of cases.

Dr. Theobald: — I think that both solutions and powders may be used with advantage. The point has not been brought out very clearly as to the class of cases in which we may prefer solutions and that in which powders are better. I have never seen any serious trouble from the use of boracic acid, but I have seen it act in this way: Suppose that we have suppurative inflammation with a small or moderate sized perforation. Boracic acid powder will often dry up the discharge promptly, but will leave the perforation considerably larger than before. In such cases solutions are often preferable and always in acute cases of this character. In acute cases it is my practice not to use boracic acid powder, but to use a solution of boracic acid. I have employed a saturated solution, allowing it to remain in the ear four or five minutes. In one case, a single application checked a profuse discharge of long standing. If the drum membrane is practically destroyed and there is a granular condition of the mucous membrane of the tympanic cavity, boracic acid powder is indicated, and, as a rule, it acts better than any other application. It, however, occasionally fails, when nitrate of silver may take its place with advantage.

As to the method of applying the powder, I have not found packing necessary. The powder blower answers every purpose and is much more expeditious. I have not found it necessary to syringe the ear as often as Dr. Knapp does. When there is considerable discharge I expect the powder to become moist in a short time, but then there is a warm saturated solution in contact with the parts for some time. The point that I would make is to use solutions

where you hope to close perforations, and powders where the perforation is extensive and all that can be hoped for is an arrest of the discharge.

Dr. Knapp:—I should like to say something more about the employment of boric acid powder. Acute suppurative otitis is certainly a disease of bacterial origin. I use boric acid as a powder with a full appreciation of the laws which govern fermentation, putrefaction, and suppuration. One of the conditions which prevent either of these processes is dryness. Nothing that is dry will ferment, putrefy or suppurate. If we apply this principle to the ear as we have an opportunity to do in the acute cases, we find that when the secretion is constantly removed or dried up, or where there is proper drainage, there will be speedy recovery with no decomposition of the secretion. In the ear, the anatomical conditions are unfavorable to thorough drainage. There are so many recesses in the middle ear cavities, and if the Eustachian tube is closed the retained secretion keeps alive the morbid processes indefinitely, whereas if they occurred in some other situation they would have a natural termination in a stated time. Acting upon this principle, if we carefully clean the ear and afterwards keep it dry, we certainly favor recovery. As soon as the boric acid is soaked I direct the patient to remove it. I do not want to produce a scab and allow the secretion to fester underneath, but after the liquid is absorbed by the boric acid, then the ear is syringed, the cavity cleansed, disinfected and some of the dry powder put in. This sterilizes the secretion, *i.e.*, produces a condition unfavorable to fermentation and putrefaction. In this way boric acid is, I believe, of great service in acute cases. The reports as to the efficiency of boric acid are so divergent that there must be among aurists some difference in the mode of application. If a great quantity of the powder is put in the ear, a scab may form and under it the

suppuration may continue. If only so much is put in that the secretion which is not absorbed by the powder can run out, there is no harm done. It only shows that the cleansing and powdering must be done oftener. I should be sorry to see this remedy lose ground.

Dr. Gruening: — I feel obliged to make a few remarks with reference to three fatal cases which occurred in my practice. In these cases, I attributed the sad termination to the use of boric acid powder. The first case was that of a young girl, aged 19 years, who had nasal and pharyngeal catarrh for which she was advised to use the nasal douche. She did so and acquired acute otitis media. There was great pain and some discharge and she was advised to use a powder. After a few days she began to suffer with headache, dizziness and intense pain in one side of the head. The region of the mastoid was swollen and tender. She expectorated pus in large quantities. When the finger was introduced behind the soft palate, it was withdrawn with a good deal of pus attached to it. I saw the patient when she had become comatose. On examining the ear, I found that the tympanic membrane was bulging. It was intensely injected, there was a small nipple-like projection and in this there had been a perforation which was occluded with powder. There was no opening and the pus which had accumulated in the middle ear was discharged through the Eustachian tube. I made an opening in the membrana tympani, cleansed the ear thoroughly and advised the family physician to open the mastoid. He did so and found the mastoid cells filled with pus. The patient rallied temporarily and recovered consciousness, but died the following day.

The second case was that of an old lady, aged 71 years, who had otitis media with perforation. Boric acid powder was insufflated. A few hours after this application she began to suffer with intense headache, which could not be

relieved by anything which was done. It was advised that the powder be used more frequently. The symptoms of meningitis made their appearance and I was called in. I found a condition similar to that in the previous case, a small opening which was occluded with powder. I made a free opening but the patient died of meningitis.

The third case was that of a child who had had otitis media for a long time, with destruction of both membranes. This was the only case in which the powder had been packed. Both ears had been packed. The child had been well up to the time that this was done. A few days after the application, the child had a chill. This was followed by repeated chills and I was consulted. I removed two plugs of concrete substance consisting of the powder mixed with pus. These were removed with great difficulty. In spite of the removal of the powder the child died with symptoms of pyæmia. A post mortem examination was not made in any of these cases.

Dr. Roosa: — I want to make a plea for an entirely different method of treatment in acute aural inflammation. I think that in a large percentage of cases, acute otitis media is a self-limited affection and in the treatment of these cases I resort to cleanliness with drying afterwards. For myself, although I know I am in the minority, I do not believe in the germ theory of disease. I think that germs are the products and not the causes of disease, that they retard recovery and should therefore be removed. I am constantly seeing cases where boracic acid has been used during the progress of the case, apparently with detrimental effect. Irrigation with warm water pro re nata, drying afterwards, general hygienic care and, where there is excessive pain, the use of leeches, are all that are needed in a large percentage of cases.

Dr. Agnew: — I would ask our colleague [Dr. Roosa] why he resorts to drying? I think that it is found in

bacteriological studies that the more we go into the natural history of microbes, the more we find that the greater number of them will resist cold and heat, and that nothing is so inimical to them as dryness. I like this method of drying and have tried to secure dryness in various ways not only by the use of powders, but also by the employment of bibulous paper carefully packed into the cavity and held there and then removed. I have noticed salutary effects in the drum cavity from this procedure.

I should like the speaker to explain why it is that he lays so much stress upon dryness. I do not want to tie him to a single word, for so much that we do is based upon empiricism. I am disposed to think from the knowledge that we now have, that continued dryness has a starving effect on the agents which tend to keep up the disease, whether they are the cause of the disease or not.

Dr. Roosa: — I consider that pus has a chemical quality apart from the germ theory which renders it corrosive. I therefore try to keep the parts free from pus and prevent that corrosive action. Those who have committed themselves to the germ theory attribute everything to the presence of germs. I try to secure dryness on account of this chemical corrosive property of the pus. I do not believe in it in the sense of absolute dryness. I think that is harmful. Dr. Knapp's comparison to a scab is unfortunate, for under a scab there is moisture. Dryness is a relative term. I would take away the pus with sufficient frequency to prevent its corrosive action, and also remove the consequences of the inflammation and of the putrefaction.

Dr. Howe: — Whatever reason we may give to ourselves for the use of boracic acid, it seems from the number who use it that we are strongly prejudiced in its favor. I would make one or two statements with reference to points brought out in the discussion. Dryness has been

spoken of as one of the objects attained by the use of the powder. Looking at this from a bacteriological point of view, I think that by taking absorbent cotton with boracic acid, we would obtain all the advantages without the disadvantages of plugging the meatus. Dr. Knapp has referred to the disinfectant powers of boracic acid in the sense of a deodorizer. I am not accustomed to use such preparations as Platt's chlorides, but I have found that this preparation in one-fourth strength can be used with good results and destroys the odor almost at once. I do not know the composition of this preparation. Sternberg puts boracic acid very low in the list so far as its disinfectant powers are concerned. Lately my attention has been called to the way in which pus of different kinds will influence the conjunctiva of young rabbits. I have taken the pus from an old suppurative case and put that into the eye, and in the majority of cases it will produce conjunctivitis. If the pus is soaked in boracic acid, it will still produce conjunctivitis. So far as the disinfecting effect of this agent is concerned, we have something better to look for. If the pus is put in a 1 to 3000 solution of corrosive sublimate, conjunctivitis is not produced. I think that it is not too much to infer that, so far as the absorbing effect of boracic acid is concerned, we can do better; that so far as its disinfecting effect is concerned we can do better; and that so far as its effect as an antiseptic is concerned, we have more to look forward to.

Dr. Sexton: — From what I have heard, I think that it would help us in the use of boracic acid to consider the kind of cases of inflammation in which it is likely to be useful. Where we have a catarrhal inflammation of the atrium, there is usually a profuse discharge and it is difficult to pack the canal with boric acid. The secretion is so free that it is washed out. In the cases alluded to by Dr. Gruening where a nipple-like formation occurs, we have

very little discharge from the atrium and the inflammation is almost entirely confined to the attic. The nipple is usually formed by the membrana flaccida and the perforation in its apex could scarcely be closed by the use of boracic acid. In these cases, I make an early and free opening, and in this way I have avoided many of the evil consequences of pent up secretions. I make the opening with a stout tenotome, with which an incision can be made through the membrana flaccida into the attic and through the integument of the upper wall of the canal, which becomes tumefied from the burrowing of fluids from the attic.

Dr. Knapp:—I should like to add a word with reference to the scab. The surgeon likes to have "healing under the scab". Where healing takes place by first intention, the scab and the tissue are closely united, and when the scab falls off in the course of a week or two, it leaves a smooth epidermis. As soon as the scab is raised and liquid collects beneath, it becomes a source of danger. It should be removed at once, the ulcer laid open, and treated according to its condition.

Dr. Seely:—As regards Dr. Howe's statement with reference to the disinfectant properties of boric acid, the doctor should bear in mind that it is not so much a question of the strength of the disinfectant as of the strength that can be used in a certain region. There are many agents more powerful than boric acid. I think, as has been said by Dr. Knapp, that the beneficial effects of boric acid are unquestionably due to its drying qualities and thus it acts indirectly as a preventive of suppuration and fermentation. I do not agree with Dr. Knapp, however, in the method of applying it. I do not see any reason for constantly exposing a sore to make it heal. In making use of boric acid my idea is to clean the ear, dry it out and then hermetically seal it from any influence from the outside. Where

I have succeeded in doing this the results have been good, but possibly I should have succeeded as well without the boric acid. It is difficult to say how much has been due to the boric acid and how much to the careful process of cleaning as a preparation for the acid. I think that too much stress is laid upon applications to the ear. The cleaning of the ear is, I think, the prime factor. Since I have practically dropped these applications, I have gone more upon the plan of simply cleansing the ear and treating the naso-pharynx. In my experience we add immensely toward the cure of the case in a large number of instances, especially in children, by treating the naso-pharynx. Along with this go the inflation and cleansing of the middle ear from the outside, not however with the syringe. This I think is deleterious. I have not syringed a suppurating ear to clean it for ten or fifteen years. The ear should be thoroughly cleaned with absorbent cotton and then inflated. In a grown person I use the catheter and in children the Politzer process. After absorbing a certain amount of the discharge from the middle ear by again introducing the probe and having the patient inflate the ear by blowing, the ear can be thoroughly dried without special irritation.

I agree with Dr. Knapp absolutely as to the parasitic theory of the disease, but it does not follow from that that we need employ a direct parasiticide, indirect parasiticidal action being certainly more effective than direct parasiticidal action. We know that to be the case in regard to conjunctivitis. In many situations to kill the parasite would be to kill the patient. Finally, I do not think so very much of the disappearance of boric acid from practice. It has done good in its way, but its period of usefulness is waning, if it has not passed.

Dr. Theobald: — I would enter a protest against the view that the good effects of boracic acid are due entirely

to its drying quality. As I have already mentioned, some of my most decided and brilliant results with boracic acid have been obtained with a saturated solution. I have seen the discharge stop after a single application. It is out of the question to say that the result is due simply to the drying effect. Moreover, I do not think that this drying effect is what we always wish to obtain. It depends very much upon the sort of case that we are dealing with. If we dry up the secretion too thoroughly when there is a moderate-sized perforation we shall probably stop the reparative action. If, on the other hand, we are dealing with an old chronic case, with extensive destruction of the drum head, we want to get the drying effect which the boracic acid powder gives us.

Dr. Burnett: — While it may not be proven that germs are the cause of disease, we all admit that their continued presence is prejudicial, as it tends to keep up the suppurative process. If we can partly remove them and sterilize their territory so that their growth will be retarded or stopped, healing will probably take place. I think that this removal may be brought about by simple syringing. I do not reject the syringe, although I am a strong advocate of the use of powders. That sterilizing serves to render the reproduction of the germs less easy, I think that we can see from a study of aspergillus. This fungus doubtless comes after some wound of the ear, but it certainly keeps up the inflammation. Aspergillus has without doubt been cured by simple syringing, but it gets well more quickly if we sterilize the fundus of the canal. I have found that this sterilization may be brought about best by chinoline salicylate with boric acid. I have invariably been able to check the growth and stop the disease by one insufflation of one part of chinoline salicylate with sixteen parts of boric acid. This simply teaches the lesson as to how these powders act. They tend to prevent the growth of the germs which have been aiding in local irritation.

Dr. Howe: — I would call attention to the fact that the reasoning in regard to aspergillus would by no means have anything to do with other forms of suppuration. We can take half a dozen different forms and the substance which acts as a thorough antiseptic with one has very little effect upon another.

Dr. Lippincott: — I certainly count boric acid a most valuable agent and would not care to relinquish its use. There are certain cases in which it acts as an irritant. After using it once or twice the patient complains of tenderness to the touch. In these cases there is an idiosyncrasy against its employment. Then something else should be substituted, such as acetate of lead or zinc. In the great majority of cases boric acid is a remedy of the greatest value undoubtedly. Where there are bad results, they can usually be explained, as in the cases referred to by Dr. Gruening, by its improper use. It is a dangerous plan to pack boric acid into the ear. If the drug is snowed in, it is dissolved by any secretion that forms.

I have seen what Dr. Theobald has referred to, that is, that under the use of the powdered boric acid, openings which were comparatively small have become larger, but can the doctor assert that the opening was really enlarged and that the smallness was not due to swelling? If, when the swelling disappears, the opening is enlarged, can that be called a misfortune?

It seems to me that the dangers from boric acid can be avoided by using a powder blower by which the remedy is applied in the form of a loose powder like snow and not in the form of a plug as by the powder blowers shown this morning.

Dr. Burnett: — I merely referred to the treatment of aspergillus as an illustration of the method of action of these powders. I do not recommend any special powder for the treatment of disease of the middle ear.

PHOTOGRAPHIC ILLUSTRATIONS OF THE ANATOMY OF THE EAR.

By Dr. B. Alexander Randall, *of Philadelphia, Pa.*, and Dr. H. L. Morse, *of Boston, Mass.*

Dr. Morse exhibited to the Society an Atlas of "Photographic Illustrations of the Anatomy of the Ear," with the following remarks:

The beautiful photographs of the ear published by Prof. Rüdinger (Atlas d. menschl. Gehör-organs, Munich, 1866-1875), a portion of which have been republished in this country by Dr. C. J. Blake (Rüdinger Atlas of the Osseous Anatomy of the Human Ear, Boston, 1874), led the authors to attempt similar work: and the nucleus of this collection was made in the winter of 1883, in Vienna, by the kind permission and with the personal assistance of Prof. Politzer, from some of the exquisite preparations in his private collection.

Since that time, through the kindness of Dr. C. J. Blake, photographs of his valuable private collection of preparations have been added; and the authors have also been allowed, by the courtesy of the Museum Committee of the College of Physicians of Philadelphia, to make use of the exceedingly interesting specimens in their possession, prepared and mounted by Profs. Politzer and Hyrtl. Microscopical sections and specimens belonging to Prof. Charles H. Burnett and to the authors themselves, complete the list.

To the gentlemen who have so generously aided us in our efforts, we wish here to tender our most hearty thanks.

Some of the results of their work they now venture to make public, thinking that the larger number of valuable specimens to which they have been so fortunate as to have access, present points of interest shown by no single collection. As the essential value of photography is in its absolute accuracy they have entirely abstained from retouching the negatives; preferring that their pictures should show imperfections in point of beauty, or even more serious shortcomings, rather than labor under suspicion of being warped from the truth. Some "blocking out", however, has been done, in the interest of neatness and contrast. All of the photographs were taken by the authors themselves, under varying conditions as to light, etc., as many of the specimens could not be removed from the Museum to which they belonged, and some of them had to be photographed through glass — conditions greatly increasing the difficulty of obtaining entirely satisfactory pictures.

The Atlas consists of 75 figures in 25 plates and is published by Blakiston, Sons & Co., 1012 Walnut street, Philadelphia. The subjects of illustration are as follows:

OSSEOUS ANATOMY.

I.	1.	Outer surface of the adult Temporal Bone.
	2.	Inner surface of adult Temporal Bone.
II.	3.	Vertical section through the External and Internal Auditory Meatus.
	4.	Vertical section through the External Meatus and Eustachian tube.
III.	5.	Section through the Mastoid, showing Air cells of usual size.
	6.	Section through sclerosed Mastoid showing few pneumatic cells.
	7.	"Paper" Mastoid with huge pneumatic cells and thin walls.
IV.	8.	Pneumatic cells at base of skull (wet preparation).
	9.	Vertical section of Temporal, showing the Facial Canal.
V.	10.	Temporal bone of Infant — outer aspect.
	11.	Annulus or Tympanic portion — inner aspect.
	12.	Squamous portion — inner aspect.
	13.	Petrous portion — inner aspect.
	14.	Petrous portion opened, to show Labyrinth.

VI.	15.	Temporal Bone from within, opened to show Drum-membrane and Ossicles.
	16.	Drum membrane and Ossicles of the same.
VII.	17.	Drum membrane, Annulus, Malleus, and Incus of Infant.
	18.	Annulus and Ossicles of Infant.
VIII.	19.	Annulus separated—outer surface.
	20.	Bony Semicircular Canals with Stapes in position.
	21.	Bony Semicircular Canals laid open.
	22.	Ampullæ of Semicircular Canals.
	23.	Opened Cochlea seen from above the Cupola.
IX.	24.	Opened Petrous, showing Cochlea and Semicircular Canals.
	25.	Opened Semicircular Canals with Stapes in situ.
	26.	Cochlea cut longitudinally from apex to base.
X.	27.	Bony Labyrinth of right side, separated.
	28.	Bony Labyrinth (left) separated and laid open.
XI.	29.	Section through the Labyrinth.
	30.	Base of Cochlea and bottom of Meatus internus.
	31.	Infant's Cochlea separated from its surrounding shell.
XII.	32.	Annulus, Drum-membrane, Ossicles and Labyrinth.
	33.	Annulus, Ossicles and Labyrinth seen from above.
XIII.	34.	Group of the Ossicles, articulated.
	35.	Set of normal Ossicles, separated.
	36.	Annulus and Sets of Ossicles.
XIV.	37.	Set of Ossicles, showing Caries of Malleus and Incus.
	38 and 39.	Anomalies of Annulus and Ossicles from Monstrosity.

DRUM-MEMBRANE PREPARATIONS.

XV.	40.	Membrana tympani in normal condition.
	41.	Ragged Perforation of Membrana tympani—with Chalk in margin.
	42.	Small Perforation up and back—Chalk Deposit below it.
	43.	Small Perforation of Membrana tympani—seen from within.
	44.	Perforation and Chalk Deposit—from within.
	45.	Calcification and Perforation—Caries of Incus.
XVI.	46.	Double Perforation of Membrana tympani—left ear.
	47.	Double Perforation—right ear.
	48.	Triple Perforation and Chalk Deposit.
	49.	Scattered Chalk Deposit.
	50.	Dense Chalk Deposit and Cicatrix.
	51.	Perforation posteriorly—Cicatrix anteriorly.

XVII.	52.	Almost complete Destruction — with Chalk Deposit.
	53.	Almost total Perforation closed by Cicatrix.
	54.	Almost total Perforation — New Membrane to Promontory.
	55.	Almost total Perforation — Membrane closing Eustachian tube.
	56.	Destruction of Membrana tympani and Bony Anchylosis of Stapes.
	57.	Caries above Short Process and Dislocation of Malleus.
XVIII.	58.	Indrawn Membrana tympani — profile view.
	59.	Cicatrix of Membrana tympani indrawn and fast to Promontory — profile.
	60.	Cicatrix of Membrana tympani indrawn and fast to Promontory — front.
	61.	Indrawn Membrana Tympani with Chalk Deposit and small Perforation.
	62.	Extensive Perforation of Membrana Tympani.
	63.	Destruction of Membrana Tympani — Membrane closing Eustachian tube.

MICROSCOPICAL SECTIONS.

XIX.	64.	Pinna of External Ear — transverse section.
	65.	Cartilaginous External Meatus — transverse section.
XX.	66.	Drum membrane and Malleus handle — horizontal section.
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XXIII.	71.	Malleo-Incal Articulation — horizontal.
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XXV.	75.	Corti's Organ of an Infant.

Dr. Randall said that attention may be especially called to the pictures of the various pathological conditions of the drum membrane which often show points discernable only with the aid of a lens in the preparations themselves: and also to the section of the Eustachian tube. In this last, the arrangement of the fibres of the Tensor Veli Palati

may be seen to differ considerably from that usually described; the major part of its fibres arising from the basilar fibro-cartilage above the tube and only a part from the Hook cartilage, while the thin inmost layer of very oblique fibres described by Weber-Liel is cut almost transversely. Such an arrangement, if usual, might seem to militate against the view that this muscle is a dilator of the tube; but such an action is rendered the more probable by this specimen, since a *bursal sac* may be seen to be placed between the ascending fibres and the Hook cartilage. No previous observations of this bursa has been met, and in but one other specimen have the authors found such a structure; but its presence here is unmistakable and seems of sufficient physiological importance to be thus emphasized.

Number 68 of the Atlas is shown in the accompanying plate. Figure 1 is a transverse section of the Eustachian tube, near its middle, nine diameters. Figure 2, the bursal sac in the fibres of the Tensor Palati muscle, fifty-six diameters.

Bursal Sac . .

Fig. I.

Eustachian Tube Transv. Section.

9 Diameters.

Bursal Sac

Fig. II.

Bursal Sac in the Fibers of the Tensor Palati Muscle, 56 Diameters.

ALPHABETICAL INDEX

OF

OTOLOGICAL LITERATURE, FROM JULY, 1886, TO JULY, 1887,

COMPILED BY

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OF THE

AMERICAN OTOLOGICAL SOCIETY,

TWENTY-FIRST ANNUAL MEETING.

Pequot House, New London, Conn., July 17, 1888.

VOL. 4, PART 2.

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OF THE

AMERICAN OTOLOGICAL SOCIETY.

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American Otological Society.

The Twenty-First Annual Meeting of the American Otological Society was held at the Pequot House, New London, Conn., on Tuesday, July 17, 1888, at 10.30 A. M., the President, Dr. J. S. Prout, of Brooklyn, N. Y., in the chair.

The following members were present:

Drs. Gorham Bacon	New York, N. Y.
Albert H. Buck	New York, N. Y.
Chas. H. Burnett	Philadelphia, Pa.
F. P. Capron	Providence, R. I.
W. H. Carmalt	New Haven, Conn.
J. B. Emerson	New York, N. Y.
John Green	St. Louis, Mo.
E. E. Holt	Portland, Me.
Chas. J. Kipp	Newark, N. J.
Arthur Mathewson	Brooklyn, N. Y.
C. S. Merrill	Albany, N. Y.
H. G. Miller	Providence, R. I.
H. D. Noyes	New York, N. Y.
J. F. Noyes	Detroit, Mich.
O. D. Pomeroy	New York, N. Y.
J. S. Prout	Brooklyn, N. Y.
B. Alexander Randall	Philadelphia, Pa.
R. A. Reeve	Toronto, Canada.
S. D. Risley	Philadelphia, Pa.
S. Sexton	New York, N. Y.
S. B. St. John	Hartford, Conn.
Geo. Strawbridge	Philadelphia, Pa.
T. Y. Sutphen	Newark, N. J.
J. O. Tansley	New York, N. Y.
Samuel Theobald	Baltimore, Md.
J. J. B. Vermyne	New Bedford, Mass.
David Webster	New York, N. Y.

The President alluded to the loss the Society had sustained, since the last Annual Meeting, by the death of Dr. C. R. Agnew, of New York, N. Y. On motion of Dr. H. D. Noyes, seconded by Dr. John Green, a committee was appointed to prepare an appropriate minute on the subject.

Drs. Gorham Bacon and W. H. Carmalt were appointed as such committee by the President.

The President appointed as the Business Committee Drs. John Green, S. Theobald, and J. B. Emerson.

Drs. H. G. Miller and Chas. J. Kipp were appointed to the Committee on Membership, in the place of Drs. D. B. St. John Roosa and J. Orne Green, both absent.

The Treasurer's Report was read and referred to Dr. T. Y. Sutphen as Auditing Committee. This Committee stated the report to be correct and the accounts properly vouched for, and the report was then accepted.

The resignation of Dr. E. Williams of Cincinnati, O., on account of ill health, was presented by the Secretary. The resignation was accepted. Under suspension of the By-Laws, on motion of Dr. W. H. Carmalt, Dr. E. Williams was then unanimously elected to Honorary Membership in the Society.

Dr. W. H. Carmalt, alternate to the Executive Committee of the Congress of the American Physicians and Surgeons, read his report, which was accepted.

The Society voted to confirm the appointment of Dr. S. O. Richey, of Washington, D. C., by the President of the Congress, as a member of the Committee of Arrangements for the American Otological Society.

Voted, that this Society at the close of this day's meeting adjourn to Tuesday, September 18, 1888, at 11 A. M., at the Arlington Hotel, Washington, D. C.

Voted, that the meeting appointed to be held at Washington, D. C., on September 18 be considered a *Special* meeting and that it be devoted *exclusively* to the consideration of scientific subjects.

The following papers were then read:

Dr. C. H. Burnett, of Philadelphia, Pa. A Case of Aural Vertigo (Ménière's Disease) Relieved by Excision of the Membrana Tympani and the Malleus.

Discussed by Drs. Tansley, Kipp, Sexton, and Randall.

Dr. S. Sexton, of New York, N. Y., exhibited:

a. A New Head-Lantern for the Employment of Electric Light in Aural Surgery, and

b. A New Portable Battery for Storage of Electro-Motor Force.

Discussed by Drs. Kipp, Burnett, Buck, Randall, Theobald, and Reeve.

Dr. A. H. Buck of New York, N. Y., read a paper on Reflex Influences in the Production of Naso-Pharyngeal Catarrh.

Discussed by Drs. Tansley, Risley, Burnett, Sexton, Theobald, J. F. Noyes, Kipp, Reeve, H. D. Noyes, and Capron.

Dr. Buck also exhibited an Anatomical Specimen from the Ear of an Elephant, with explanatory remarks.

Discussed by Dr. Sexton.

Two papers by Dr. Huntington Richards, of New York, N. Y., entitled:

A Case of Polypoid Angioma of the Ear with illustrations (3 Micro-Photographs), and

A Case of False Drum-Membrane, were read by Dr. A. H. Buck.

The latter paper was discussed by Drs. Sexton, Sutphen, Tansley, Kipp, Mathewson, Risley, Theobald, Burnett, and Randall.

Two papers by Dr. S. Sexton, of New York, N. Y., entitled:

Periostitis Externa of the Mastoid, and

Some of the Indications for Excision of the Drumhead and Malleus, were read by title.

At 2 P. M. adjourned to 8 P. M.

Evening Session.

The President called the Society to order at 8 P. M. The minutes of the morning session were read and approved.

The reading of papers was then continued.

Dr. J. B. Emerson, of New York, N. Y., read a paper on The Flexible Catheter as a Drainage Tube, with cases.

Discussed by Dr. Pomeroy.

Dr. Chas. J. Kipp, of Newark, N. J., reported: Three Cases of Transient Bilateral Horizontal Nystagmus in Connection with Purulent Inflammation of the Middle Ear.

Discussed by Drs. Pomeroy, Webster, and Tansley.

Dr. J. Oscroft Tansley, of New York, N. Y., exhibited an Improved Aural Snare.

Discussed by Drs. Pomeroy and Theobald.

A further contribution by Dr. S. Sexton, of New York, N. Y., entitled Foreign Bodies in the External Auditory Canal, was read by title.

Dr. E. E. Holt, of Portland, Me., made a few additional remarks on the case of Teratoid Tumor, reported five years ago.

The different papers read by title were referred to the Publishing Committee.

On recommendation of the Committee on Membership the following gentlemen were elected to membership by ballot:

DR. B. ALEXANDER RANDALL . . . . . of Philadelphia, Pa.
DR. F. M. WILSON . . . . . of Bridgeport, Conn.
DR. G. W. HALE . . . . . of Nashville, Tenn.
DR. JEFFERSON BETTMAN . . . . . of New York, N. Y.

The Committee appointed to prepare an appropriate minute on the subject of the death of Dr. C. R. Agnew, reported the following:

"The American Otological Society desires to place upon its records the sense of the loss it has sustained in the death of Dr. C. R. Agnew, one of its founders and one of its most constant attendants.

"His interest in Scientific Otology was keen and from his wide experience in aural diseases and in the careful analysis of his cases, he contributed greatly to the interest and success of the meetings.

"We regret that we shall have no longer the benefit of his ripe judgment in our discussions and we think it due to his memory that we should express our appreciation of his worth as a man and as an earnest and conscientious physician, ever desirous of advancing the interests of scientific medicine."

Accepted and ordered to be entered in the records.

The Business Committee reported the following list of officers for the ensuing year:

President: . . . . . Dr. J. S. Prout, of Brooklyn, N. Y.
Vice-President: . . . . . Dr. Gorham Bacon, of New York, N. Y.
Secretary and Treasurer: . Dr. J. J. B. Vermyne, of New Bedford, Mass.
Committee on Membership: Dr. Arthur Mathewson, of Brooklyn, N.Y.; Dr. D. B. St. John Roosa, of New York, N.Y.; Dr. J. Orne Green, of Boston, Mass.
Committee on Publications: Dr. J. J. B. Vermyne, of New Bedford, Mass.; Dr. C. J. Blake, of Boston, Mass.; Dr. J. Orne Green, of Boston, Mass.
Member of Executive Committee of Congress of American Physicians and Surgeons: . . . . . Dr. W. H. Carmalt, of New Haven, Conn.
Alternate: . . . . . Dr. Gorham Bacon, of New York, N. Y.

These officers were all elected on ballot.

The Committee further recommended that this Society hold its next Annual Meeting the day before the Annual Meeting of the American Ophthalmological Society and at the same place. Adopted.

It was moved that in the opinion of the Society it was considered desirable to continue the Alphabetical Index of Otological Literature as published in the Transactions since the last few years. Adopted.

At 9.45 P. M. adjourned.

J. J. B. VERMYNE, *Secretary.*

FOREIGN BODIES IN THE EXTERNAL AUDITORY CANAL.[1]

By Samuel Sexton, M. D., *New York, N. Y.*

Foreign objects in the ear do not cause any trouble usually, if let alone, unless they interfere with the entrance of sound, or, as in the case of living insects, give rise to disturbance by their movements. It is the alarm created by unskillful attempts at their removal which invests this subject with a special interest. The frequency with which troublesome cases of this kind are met with makes it important to keep in mind the anatomical relations of the parts to these intruders lest harm should result to the organ of hearing during efforts at removal.

Adults are not in the habit of putting foreign bodies into their ears. To this statement, however, an exception should be made of lunatics who, as is well known, have the habit of stuffing cotton-wool, pellets of fabrics and paper, or almost any substance that comes to hand, into the ears, for the purpose of keeping out unpleasant noises.

Foreign bodies are not often met with in the ears of very young infants; the writer recalls a few cases from memory, but the records show none under two years of age. In most cases they are introduced in play by themselves or by playmates; and were not the meatus in children naturally contracted by the advance of the cartilage composing the concha, which here forms the elastic posterior border of the lumen, the introduction of foreign bodies would be of much more frequent occurrence. When objects are slipped beyond this natural constriction, they are indefinitely retained, since they cannot fall out again of themselves, nor can they be removed by jarring the patient's head whilst the ear is turned downward.

[1]Read by title.

The accompanying table shows ages and sex in 101 of the author's recorded cases of foreign bodies:

	MALES.	FEMALES.	
Under 10 years.	21	23	= 44
10 to 20 years.	7	11	= 18
20 to 30 years.	13	5	= 18
30 to 40 years.	4	1	= 5
40 to 50 years.	6	3	= 9
50 to 60 years.	3	2	= 5
Over 60 years.	1	1	= 2
	55	46	=101 Total.

Of those under ten years of age 4 were two years old, 8 were three years old, 12 were four years old, 5 were five years old, 3 were six years old, 3 were seven years old, 5 were eight years old, and 4 were nine years old.

A complete enumeration of the various articles found in this out-of-the-way hiding place would include specimens from almost every department of animate and inanimate nature coming within the domestic domain. The following is a list of such objects found among the author's recorded cases:

Small pebbles 5
Fragment of brownstone 1
Glass beads 3
Doll's glass eye 1
Spicula of glass 2
Sea-shells 3
Buttons 3
Sand 1
Pieces of chalk 1
Balls of putty 3
Solidified mortar 2
Piece of slate pencil 2
Rubber end of pencil 1
Ivory end of pencil 1

Cockroaches 13
Bedbugs 5
Flies 5
Maggots 4
Insect (unrecognized) 1
Portion of an insect 1

Cherry stones 8
Beans 6
Peas 4
Lentil 2
Locust bean 1
Lemon seed 1
Grain of Indian corn 1
Spice 1
Chewing gum 1

Cotton wool pellets 10
Wad of cotton cloth 1
Wad of paper 3
Roll of paper 1
Folded splinter of wood 1

Desiccated milk 1
Particles of camphor, etc. . . . 1
Geranium leaves 1

Stiff hairs from beard 1
Not stated 1

It is found on referring to the records that foreign bodies, if undisturbed, may remain in the ear for an almost indefinite period without exciting any local irritation, though now and then reflex disturbances in other regions may be traced to this source. Of nineteen cases, selected at random, it was found that in six the object had been in the ear for one or two days, in one for three days, in two for two weeks, in one for three weeks, in one for ten months, in one for two years, in three for three years, in one for four years, in one for seventeen years, in one for twenty-six years and in one for sixty years.

Foreign bodies may be classified as Animate and Inanimate.

I.—Animate Objects in the Ear.

Flies and Maggots.—That insects and vermin may infest the ear was, of course, known to the ancients, who attached much more importance to their presence than any harm arising from this source warranted. Du Verney, however, surmised that the heat of the parts hatched out the eggs which insects might deposit there. In neglected otorrhœa in filthy subjects, it is not uncommon to find larvæ in the purulent secretions which are allowed to collect in the external auditory canal, and sometimes flies themselves get entrapped in the canal and remain there until the syringe is employed.

These cases are frequently seen in hospital practice.

The following are given as examples:

Case I.—Flies in ear of patient, with otorrhœa; removal with syringe.

H. V., aged 7 years, came to the Infirmary July 23, 1883. Four years ago the patient had scarlet fever, lasting for about five weeks, which was followed, for one or two weeks, by a discharge from both ears. At the end

of that time, it ceased in the left ear, but has continued in the right to the present time. The discharge is very offensive. Some slight impairment of hearing was found in the right ear. Examination showed the right external auditory canal filled with pus. On syringing, three flies were removed with the pus.

Case II.—Seventeen living maggots in the ear.

Hugh F., aged 19 years, working in a cattle yard, came to the Infirmary with the history of acute purulent inflammation of the left ear from sea bathing five weeks before. Several days ago the ear became painful and the discharge increased. Examination shows the dark heads of seventeen maggots presenting in the lumen of the left ear, filling it completely.

They were removed by syringing.

Case III.—Living maggots in the ear.

Patient, a girl 4 years of age, has had a discharge from the right ear for three years. Yesterday some maggots were seen in the lumen of canal, and one of them came out. The rest were removed by syringing.

Bugs, Roaches, and Other Vermin.—These are for the most part found in the ears of persons having no discharge from the ear.

The following cases came to the New York Eye and Ear Infirmary for relief.

Case IV.—Bug remaining in the ear one-half day; removed with syringe.

M. C., aged 21 years, says that on awakening this morning, she "felt the legs or wings of something moving around in her right ear." This sensation alternately ceased and recurred. She has had at no time any

tinnitus aurium, nor impairment of hearing, even when the insect was at rest or moving upon the drumhead.

Examination shows a small black body at first lying on the posterior inferior quadrant of the membrana tympani but afterwards on the anterior inferior quadrant, as it has changed its position. Syringing brought away the dark body, which proved to be a small bug.

Case V.—Bedbug in the ear.

Female, 26 years of age. Was awakened yesterday night with some object moving about in the left ear, causing intermittent sounds like "the sea," "buzzing," etc., and a "deafness." She put water in the ear, this being followed by slight relief. The trouble increases if she lies on the right ear. She has had some vertigo. Hears loud voice only in left ear.

Examination shows an insect lying upon the posterior inferior quadrant of the drumhead close to the wall of the canal. On removing this with a syringe it was found to be a good sized bedbug.

Case VI.—Bedbug in the ear.

A female, 23 years of age, was suddenly awakened while in bed this morning by something buzzing in the left ear and which has continued to "jump at intervals" ever since. The annoyance is so great that she cannot attend to any work. A small black bug can be seen upon the anterior inferior quadrant of the drumhead. It was blown out of the canal with an air-bag.

Case VII.—Effects of a bedbug getting into the ear.

David K., aged 40 years, came to the N. Y. Eye and Ear Infirmary complaining of having for the past two months tinnitus in the left ear "like distant vibrations of a small bell," at night only—while lying in bed upon

the left ear. The noise of passing streetcars changes this to "a rattling" which he compares to the "chuck of a chicken or some one trying to whistle." This noise gradually increases and "booms away" all night, keeping him from sleeping. On one occasion similar sounds were heard whilst a canary bird was singing in the room. Syringing brought a dead bedbug away from the left ear.

Case VIII.—Cockroach in the ear.

Mary K., aged 55, came to the Infirmary stating that some insect had got into one of her ears last night during sleep. She was awakened and failing to get it out with a hairpin which caused increased distress, put a few drops of spirits of hartshorn into the canal to kill it. The insect, a roach, was removed by syringing. The canal had been so much irritated that the appearances were uncertain, but the disagreeable buzzing ceased and the parts healed eventually.

Case IX.—Cockroach in the ear causing myringitis.

Patrick P. came to the N. Y. Eye and Ear Infirmary with the statement that, while playing with his children upon the floor the day before, he felt an insect enter the left ear. The constant fluttering it kept up occasioned great distress. Examination showed a large cockroach which had forced itself inward against the drumhead and was unable to retire again. It was found, on its removal with curette and forceps, to be dead. The drumhead was highly inflamed.

Case X.—Cockroach in the ear. Maltreatment.

Mrs. K. came to the Infirmary with the statement that three days ago, after retiring, she felt something fall into the left ear. This was followed by tinnitus caused by some object crawling about in the ear. A druggist in the

neighborhood endeavored to remove it with an instrument like a crochet needle, causing syncope: and failing in this, "put something in the ear." She has syringed the ear three times a day ever since with warm soap suds and some mixture ordered by a physician. Patient is in the fifth month of pregnancy, nervous, and the ear is painful. These efforts produced a perforation in the drumhead and gave rise to acute inflammation of the middle ear, and to much laceration of the canal, from which she recovered slowly. The roach was removed with forceps.

Case XI.—Cockroach in the ear.

Mrs. Emma D., aged 46 years, came to the Infirmary with the statement that about four o'clock in the morning she was awakened by a live object crawling about in the right ear and causing much buzzing. She endeavored to "catch" it with a hairpin and afterwards used sweet oil instillations. Every manipulation caused increased activity of the insect. The movements sounded so loud that she became intensely nervous: in fact, "almost crazy." On examination the tail of the insect was seen and came away in the grasp of the forceps. The body was dislodged from the *cul-de-sac* with a curette. Previous syringing had no effect.

Case XII.—Cockroach in the ear.

A youth, 17 years of age, woke up yesterday morning with a "buzzing" and "sounds of water" in left ear. Has some tenderness in swallowing or yawning, and on stooping down he is dizzy. He tried "to get it out" by turning the ear down and using a hairpin. His hand slipped and fell upon the hairpin, causing much pain. Removed by syringing. The canal was somewhat lacerated and the drumhead injected.

Case XIII.—Cockroach in the ear for four years.

Louisa M. came to the New York Eye and Ear Infirmary, in October, 1878, giving the following history: Four years ago, whilst in bed, she was aroused by something buzzing in the right ear. The employment of a hairpin failed to bring anything away that night, nor did any better success attend syringing the ear next day. She made frequent attempts to clear the ear with a hairpin, but could never pass it as far into the right ear as into the left. A few days ago, however, she removed the leg of a roach from the right ear. She stated that when any noise was heard like the ringing of a bell, loud laughter, or passing streetcars there was a feeling as though the ear were "stuffed up," followed by ringing sounds for a while. Examination showed the presence of a cockroach lying against the anterior wall of the right external auditory canal, impinging on the drumhead. It was removed with forceps.

Case XIV.—Living cockroach in the ear.

A woman, 55 years of age, came to the Infirmary on feeling something crawling in her left ear this morning. Water poured into the ear was not followed by any relief and the employment of a hairpin caused slight hemorrhage. She now feels the insect scratching in the ear every few moments, this being attended with a "drumming" noise.

Examination shows that the roach on entering the ear found itself entrapped, since after lodgment against the drumhead it was unable to turn around and its outspreading wings prevented retrograde movements. In struggling, constant impacts were made upon the drumhead just behind the short process, at which point the membrane was afterwards found divested of its dermic layer, and bleeding.

The insect was extracted alive with forceps. The canal was considerably lacerated.

Case XV.—Living cockroach in one ear and a dead one in the other.

Frank H., aged 20 years, states that there has been pain in the left ear at times for the past six months, and on waking this morning a "buzzing" in the right ear was felt, with slight dizziness and pain. Hearing unimpaired.

The insect in the right ear was found lying across the canal perpendicularly, with its belly presenting, and was removed with warm water injections and forceps. The dead roach was removed from the left ear next day.

II.—Inanimate Objects in the Ear.

Bathers are liable to get both animate and inanimate objects in their ears whilst in the water. A minute gastropod is found clinging in great numbers to the tall grass of salt marshes, and is often found upon the neighboring beach; these when lodged in the ear are not always easily removed. The following are examples:

Case XVI.—Sea-shell in canal causing accumulation of cerumen accompanied by autophonous voice.

A singer (soprano), aged 23 years, came to the writer with the statement that for five weeks she had had autophonia, and that the leader of the orchestra complained that she sang out of tune. To herself it seemed much too high and was false: it had a "hollow sound" and "went out of the right ear." For three weeks she had experienced a ringing in the right ear which came on suddenly. There was also occasional "whistling." Examination showed that she was only able to hear the voice when shouted, in the right ear, and when loud, in the left. She had a sea-shell in the right ear,

embedded in cerumen, showing that it had been there for some time. She was at first unable to account for the presence of this shell, but on enquiry it was learned that a year and a half ago she had been at the sea-side and bathed in the surf frequently. She had not suspected that her false singing was due to any aural, but thought it was due to nasal disease. The voice became true after the shell was removed.

Case XVII.—Sea-shell in the ear.

Boy, aged 4 years, put a sea-shell in the left ear that he "might hear the sea." He was taken to a dispensary where fruitless efforts at extraction were made.

Examination:—The concha and canal contain blood clots: the parts are lacerated and continue to bleed so that when the patient was placed under ether it was found difficult to move the object (which had been pushed back into the *cul-de-sac*) either with curette or forceps. After directing a stream of water beyond, it was turned slightly and then seized with foreign-body forceps and removed. Drumhead uninjured.

Case XVIII.—Sand in the ear from surf bathing.

A gentleman informed the writer that, while bathing in the boisterous surf a few weeks before, a breaker dashed against the left side of his head, some of the water entering the left ear and leaving an uncomfortable feeling.

Examination showed a considerable quantity of sand, held together by ceruminous matter, lying in the *cul-de-sac*, at the inner end of the external auditory canal, and which required considerable syringing and the aid of a bent silver probe, for its removal. The canal was very large, and took an unusually deep curve downwards from the isthmus to the drumhead, the bottom being beyond the range of vision.

Hard Substances such as Beads, Buttons, Pieces of Stone, Glass, and the Like.

Case XLV.—Doll's glass eye in the ear for one year.

A boy, aged 7 years, was brought to the Infirmary with the statement that one year ago while throwing sand and pebbles with some boys, one of the latter got into the right ear. The ear pained and there was a slight discharge, but the symptoms lasted for a short time only. He has, however, complained of tinnitus in the ear like "flowing water," and there is some deafness. He always lies on the right side while in bed, with his hand to the ear. Two months ago the mother first noticed something in the ear which she believed to be a pebble.

Examination:—Can hear low voice in both ears. Just within the meatus of the right ear can be seen without the aid of a speculum an opalescent object lying on lower wall, but not entirely closing the passage, which is large. On removal with curette it was found to be a glass eye of a doll.

Case XLV.—Solidified mortar in canal. Attempts of the mother at its removal with a hairpin cause laceration of canal and rupture of drumhead.

A girl, 3 years of age, came with her mother, giving the history of having put some solidified mortar in the left ear. The mother had lacerated the canal very much with a hairpin before bringing her, and on removing the object (under ether) with curette it was found that she had also ruptured the drumhead.

Case XLVI.—Piece of chalk in ear, remaining two days: removed with forceps.

L. S., aged 3 years. Two days ago the patient pushed a small square piece of chalk into the right external auditory canal. The mother of the patient subsequently

attempted its removal, and, after failing, brought the child to the Infirmary. Examination showed a white body in the right external auditory canal.

The foreign-body forceps easily removed this white body, which proved to be a piece of chalk. No morbid symptoms were reported, and there were no physical signs to indicate any injury to the ear.

Case XXII.—Round button in ear, remaining two months; ineffectual attempts at removal; removal under anæsthesia.

B. S., aged 5 years. Two months ago the patient put a round china button into her left external auditory canal, where it has remained ever since. Attempts were made at one time by the family physician to remove the foreign body, but were unsuccessful, and caused great pain. Examination showed a foreign body in the left external auditory canal.

The patient having been anæsthetized the object was removed by foreign-body forceps, and proved to be a round china button.

Case XXIII.—Stone in ear, remaining six months; ineffectual and harmful attempts at removal; removal with syringe and curette.

O. S., born in Germany, aged 7 years. Last summer a playmate put a small stone into the patient's right external auditory canal. It caused some pain at the time; and whenever he tried to lie with his right ear upon the pillow, the pain became intolerable. On November 30, his mother, in trying to clean his right ear with a hairpin, felt it scratch the stone. At the same time, this caused the patient such pain that he cried out. His mother, after fruitless attempts this morning, December 3, to remove the stone with a hairpin, and having hurt the patient

a great deal, brought him at once to the Infirmary for relief.

The patient states that, except when the stone is interfered with, he experiences no distress. He hears with his right ear low voice at a distance of fifteen feet.

Examination showed the external auditory canals to be rather large, affording an unusually distinct view of the passage. The right one contains a little cerumen, but the stone can be plainly seen just beyond the lumen. Efforts at its removal with curette and foreign-body forceps were futile, but this was finally accomplished by a strong, well directed stream of water from the syringe. The stone was smooth, somewhat ovoid, but flattened. The wall of the canal was slighty abraded at the isthmus, but the drumhead was intact.

Case XXIV.—Spicula of stained glass in the ear.

Maggie M., aged 2½ years, was brought to the New York Eye and Ear Infirmary. Her mother thought she had put a shoe-button in the right ear, and in attempting its removal with a hairpin had lacerated the canal of her child so much that an examination was difficult, on account of the swelling and purulent secretions. Patient had not slept for two nights on account of the pain. The parts in front of the tragus were much swollen.

The child was firmly held, with difficulty, when a dark substance was seen through the speculum, lying well down in the canal. The object was easily moved, but on attempts at extraction it disappeared from view. Syringing, curette, and forceps were used without avail, when the child was narcotized with chloroform. Syringing while the ear was turned downwards brought away a large fragment of stained glass, having sharp edges. Recovery soon followed.

The seeds of fruit naturally come into the hands of children and are exceedingly convenient objects to poke into the ear. Here are some examples of this and of other articles in domestic use.

Case XXV.—Two cherry-pits in ear: one removed by mother with hairpin: the other removed at Infirmary with syringe and forceps.

L. S., aged 4 years, came to the Infirmary, August 13, 1883. The patient's mother stated that she removed a cherry-pit from her right ear, two weeks ago. While cleaning her right ear yesterday morning, August 12, the mother inflicted pain, of which the patient complained; this pain has continued ever since then.

Examination showed another cherry-pit deep within the right external auditory canal, the walls of the latter being much congested. The left ear was normal. Syringing brought the cherry-pit to the vicinity of the meatus, from which it was removed with the foreign-body forceps.

Case XXVI.—A sprouting cherry-pit in the ear.

A girl, 4 years of age, was brought to the Infirmary with the history of having had a cherry-pit put into the right ear by a school-mate three days before. The patient complains of autophonia only. Examination shows an object closing lumen of canal, just within outlet. Efforts at extraction with forceps and curette only ended in pushing the mass further in. It was easily brought away, however, by syringing and proved to be a sprouting cherry-pit.

Case XXVII.—Half bean in ear: ineffectual attempts at removal: under anæsthesia, bean removed in fragments.

G. F. F., aged 5 years and 7 months, came to the

Infirmary, August 26, 1882. On August 25, the patient, while at play, put half a Lima bean into his left external auditory canal, and in attempting to remove it with his finger, pushed it farther inward. Shortly afterwards he attempted to remove it with a pin, and pushed it still further from the meatus. The patient then went to the family physician, who tried in vain to remove it with instruments. He subsequently made another unsuccessful attempt the same day. He then gave the mother a liquid which he ordered her to drop into the patient's ear as fast as it evaporated, telling her to return with the patient the following day. There had been no discharge from the ear. It was found unadvisable to attempt removal of the foreign body on account of the exceedingly restless condition of the patient. Two days later, patient was anæsthetized and the bean broken up into fragments and removed. The canal was swollen and red for a few days afterwards and there was some pain on mastication.

Case XXVIII.—Bean in ear, probably for 60 years, causing deafness.

A lady, 64 years of age, came to the writer on account of deafness and a tickling in the throat, for both of which she had at different times been treated without relief.

Examination showed a dark object in the right ear which was brought away with the aid of curette and forceps, relieving the symptoms complained of. The foreign body proved to be a bean which probably had been in the ear since infancy, since she had no recollection of ever having put it there. It was very dry and came away in two equal portions.

Case XXIX.—Locust bean in the ear, causing otalgia.

A locust bean was put in the ear of a girl, aged 14 years, by her sister, eight years before, while in Paris. She

often complained of earaches and some deafness. Owing to its impaction in the canal it could not be removed without employment of the foreign-body forceps.

Its outer surface was concealed by wax.

The smooth hard cortex of this object makes it exceedingly difficult to remove when impacted, since forceps, when made to bite, slip off its surface.

Case XXX.—Pea in the ear. Attempts at its removal by mother cause acute otitis media purulenta.

A girl, aged 5 years, came to the Infirmary with the statement that one of her playmates at a Kindergarten school had put a pea, which was used in one of the lesson games, into her right ear. On going home the mother tried to remove it with a crochet-needle, but failed.

Examination shows some blood clots and a sanguinary discharge due to middle ear inflammation and resulting from these efforts at removal. The pea became softened and passed out with the discharge.

Case XXXI.—Spice seed in the ear.

A boy, 4 years of age, was brought to the Infirmary by his mother, who stated that two weeks ago he had complained of having "something in his ear," and which had been introduced some months before, in play. Four days ago she discovered a black object in the left ear, and, on trying to get it out, pushed it farther in. She then took him to a druggist, who made unsuccessful attempts at removal and gave her camomile tea to syringe the ear with.

The patient was given ether and, under electric light illumination, a spice seed was removed with curette.

Case XXXII.—Pea in the ear. Maltreatment in attempts at removal.

A girl, aged 4 years, came to the Infirmary on account of an

injury to the right ear four days previously, from the efforts of a physician to remove a pea. The ear bled profusely from the manipulations and was painful. The canal was so much obstructed by the swelling of its lacerated walls and blood coagula, that no diagnosis could be made. A sero-sanguineous discharge had been established, and the pain was absent. The foreign body (if any) was left until the inflammation abated, but the patient did not return.

Miscellaneous Objects in the Ear.

Case XXXIII.—Chewing gum in the ear.

A boy, 6 years old, was brought to the Infirmary with the following history: About two months ago he put a small mass of chewing gum into the left ear. On the same day his mother attempted its removal with both the bent and pointed ends of a hairpin, causing a little hemorrhage. She syringed the ear with cold water, forcing the object farther in. A month later on the boy began to complain of pain and noise in the ear, and there was some periauricular swelling. The gum could be easily seen and after syringing once it was brought away with the curette. The drumhead looked macerated and was desquamating.

Case XXXIV.—Cotton wool stuffed into ears.

A messenger boy, 18 years old, came to the Infirmary on account of tinnitus "like air going around in ears" and deafness. It was found that both ears contained several wads of cotton wool enveloped in wax which had been thrust into the ears during the past two months on account of the above symptoms. The patient came several times during the following year, having rapid accumulation of wax and distressing autophonia and noises in the ears.

Case XXXV.—Splinter of wood folded and put into ear.

Male patient, aged 23 years, experienced three days ago much itching in the right ear which had long been the seat of chronic purulent inflammation.

To allay this he took a tough splinter of wood, two and one half inches in length, from a barrel hoop and, folding one extremity upon itself so as to avoid wounding the parts, passed it down into the tympanum (the drumhead being absent). When he sought to withdraw it, the bent end sprang open and unfolded itself in the expanded inner end of the canal, and could not be withdrawn. He cut off the projecting end at the concha with scissors and came to the writer for relief. The outer end of the splinter was seized with forceps, and the patient quickly jerked away the head, without bringing it away, however. Its removal required a strong pull.

Case XXXVI.—Camphor and flaxseed in the ear.

A girl, 4 years of age, came to the Infirmary. On examination the external auditory canal was found filled with particles of camphor and flaxseed used in poulticing, together with some irritating oil from a drug store, and a pellet of cotton wool. The retention of these for two weeks had caused much irritation.

Case XXXVII.—Obstruction of the right ear with desiccated milk.

A woman, 35 years of age, was advised by a physician to syringe the ears with milk on account of a sensation of "a worm trying to crawl out of the right ear." The treatment increased the distress, and on examination a large tough mass of dried milk and loosened epithelium was found impinging on the drumhead.

Case XXXVIII.—Closure of the left external auditory canal with geranium leaves introduced for the cure of toothache.

Henry F., aged 47 years, two weeks ago, while suffering from pains in the left upper molar teeth, crammed the left meatus full with geranium leaves. Examination showed that they had been pushed back against the drumhead and were the cause of tinnitus, for which he came for relief. The introduction of the foreign matter had been forgotten until they were removed.

Hairs are frequently blown or brushed into the ear by barbers, and sometimes long stiff hairs grow from the walls of the external auditory canal and, pressing backward, give rise to very disagreeable sensations.

Case XXXIX.—Stiff hairs from whiskers lying in canal and causing tinnitus aurium.

A medical friend of the writer, aged 29, came in March, 1881, with the statement that five days ago, after passing the rolled up end of a napkin into the right meatus (which is quite large) he experienced a "click" or metallic ring, which afterwards occurred frequently, especially during the acts of yawning, mastication, or shaking the head. There is no pain, but he experiences interference with sound perception when making physical examinations of the chest.

Examination showed that a stiff whisker hair, three quarters of an inch long, was held by its own elasticity and bowed back against the drumhead, the two ends being braced against opposite walls of the canal. Forceps and probe proved disagreeable when efforts were made to dislodge it, but syringing brought it and several shorter hairs away from the drumhead. It resisted several attempts with the syringe and was finally taken out of the canal with forceps.

The author has been frequently requested to remove pins which have been lost in the ear, and quite often an examination has failed to discover any. On one occasion, however, it was found that the pin, which proved to be a short one, having slipped head foremost from the patient's fingers into the ear, had, after vigorous efforts at removal, been buried at the point well into the cartilaginous portion of the canal. The swollen integument made manipulations exceedingly painful. It was not deemed safe to seize the pin with forceps and liberate its point by pushing it back, for this manœuvre would endanger the membrana tympani. But either this risk must be taken, or the integument of the canal must suffer certain laceration; the latter was regarded as the least of the two evils, and the pin was therefore seized, as far back as possible, with stout forceps, and the point elevated by a probe placed underneath; the exercise of slight force now secured its liberation.

The habit of thrusting pencils into the ear is sometimes attended by the mishap of a separation of the mounting, an accident not often met with among women, for they usually employ a hairpin in scratching the ear.

Several cases of the above were recorded.

The symptoms caused by foreign bodies in the ear are not always marked unless sound is excluded, since they have been allowed to remain a life time undetected. The seed of fruit or other germinating objects, however, sometimes sprout in the canal, giving rise to irritation; or where the ear has been wounded in fruitless efforts at removal and a discharge has been set up, they either macerate and break down or become embedded in a mass of exfoliated epidermis, inspissated blood, and pus. In other cases the integument embracing them becomes thickened and indurated from the irritation caused by their presence, or they become a nucleus for ceruminal collections and may be mistaken for the latter only.

Patients are met with who cannot resist trying to do something for distress in the ears; it is due to this fact that wooden tooth picks and the like are, after being chewed up until soft, thrust into the ear and left there; in like manner pins are sometimes lost in the external auditory canal; instances of which accidents have been already cited.

Certain children are prone to put things in their ears: in one instance a glass bead and a dead bug were removed from the same ear; in another a glass bead with several links of a rosary were found. Objects sometimes flying in the air enter the ear, as fragments from the stone-dresser's chisel, balls from a "putty blower," or flies, and the like.

Removal of Foreign Bodies.—Du Verney[1] in speaking of obtsructions occasioned by extraneous bodies, such as peas, shot, nuts, kernels, and the like, which may be introduced into the external auditory canal, says: "When they have been put in a great way it is extremely difficult to extract them, because they are inclos'd by this long passage, which is very oblique, and proceeds downward towards the *Membrana Tympani*." In respect to their removal he says:[2] "We must first consider whether they are Bodies that may grow softer, such as Peas, or whether they are hard and solid, such as Leaden-Shot, Fruit-Stones, etc. We must also observe whether these Bodies are inclos'd in the cartilaginous Passage, or whether they are entangl'd in the bony Passage. To extract soft Bodies which have gotten no further than into the cartilaginous Passage, we must endeavor to break them, or to introduce the Scoop behind them, which may be effected in a supple, pliant Part, such as the Cartilage of the Ear is, and so draw them out of the Passage, which also is successful for Hard Bodies in the same Place, which may be extracted either

[1] Traité de l'organe de l'ouïe. Paris, 1683. Page 154.
[2] Op. Cit., page 160.

with the Scoop or the *Terebra*.[1] As for those Bodies which are in the bony Passage, it is extremely difficult to extract them, * * especially when they entirely fill up the passage: for then it is easy to understand that neither the Scoop nor the *Terebra* can be of any great Service. Therefore, in this Case I recommend the making an Incision into the back part and top of the Ear, which may very safely be practic'd in this Place, where there are no considerable Vessels, and where the Passage is cover'd with nothing but a glandular Skin, * * By this means we partly avoid the Obliquity of the Passage, and make use of the *Terebra:* which is best to use in the Extraction of Shot." If a Fruit-Stone should be inclosed in the bony passage, Du Verney makes use of a forceps, the *tenaculæ*. He recommends an after treatment similar to that cited further on as indicated for "Pain."

Since the time of Du Verney a great many devices have been suggested for the removal of foreign bodies from the ear; among these may be mentioned a revival of the *terebra* in various forms for boring into the object: various hooks and forceps, wire loops, the adhesive method, the galvanocautery for breaking down organic substances, and others too numerous to mention. The requisites for the successful removal of foreign bodies lie rather in a knowledge of the anatomy of the ear and experience in the work, than in a multiplicity of instruments. Efforts should be made to allay the undue excitement so often present in the family, since the patient may be affected more by this than even from rude attempts at removal. There occur, doubtless, a greater number of deaths from the effects of shock in this manner than is generally supposed, such cases not coming under the specialist's notice. Dr. Maus R. Vedder, of this city, mentioned a case of this kind to the writer which he saw in consultation some years ago. The pa-

[1] An instrument for boring into an object. (Tire-fond, trepan.)

tient was a girl 11 years of age who had introduced a dried bean in the ear. The family physician at the time made ineffectual efforts at removal by syringing and the use of instruments. The child became very nervous and was suffering greatly from pain in the ear when Dr. Vedder saw it a week afterwards: the outer region of the organ and external auditory canal were greatly swollen and the bean was so firmly embedded in the walls of the latter that further efforts at removal were not advised. Cerebral symptoms, with vomiting and convulsions, setting in, the child died shortly afterwards of meningitis.

With the exceptions to be mentioned the management of foreign bodies recommended by Du Verney has stood the test of two hundred years' experience. But we no longer attempt to break down foreign bodies before their removal nor is the detachment of the auricle often found necessary. As regards his after treatment some remarks will be made further on.

When skillfully used, under good illumination, the

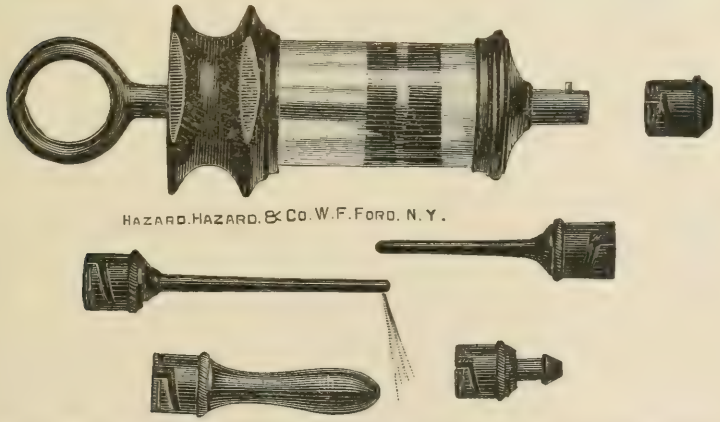


Fig. 1. The Author's Glass Syringe with various nozzles which may be fixed by a bayonet attachment.

syringe or foreign-body curette, and either light dressing forceps or the author's foreign-body forceps, constitute an

ample armamentarium for nearly all cases, from the most simple to the most difficult. There are, indeed, very few objects that the author does not remove with the curette or a long silver probe which has been slightly undercut and serrated at the bulb. (Fig. 4.)

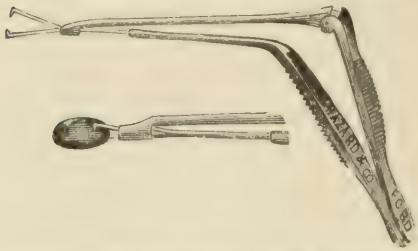


Fig. 2. Author's Foreign-Body Forceps.

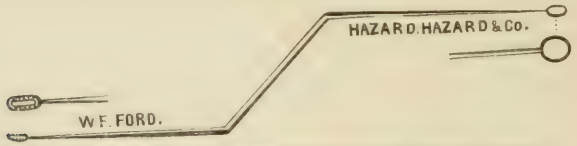


Fig. 3. Foreign-Body Curette with bent and serrated beak.

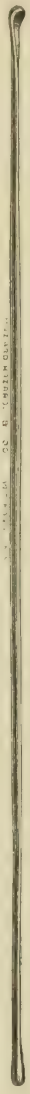


Fig. 4. Silver Probe.

The ordinary two-and-a-half-inch head mirror with the light afforded by an argand gas burner, or even an oil lamp, illuminates the ear sufficiently in ordinary cases; but in the more difficult ones an electric light illumination is best,[1] especially where ether is administered, on account of the danger of its ignition from an exposed flame.

It is a necessary precaution *to first make sure of the presence of a foreign body in the ear before efforts at removal are undertaken*, for it is well known that the ear is often much injured, specially in children, by injudicious probing after fancied objects where parents were quite positive that a foreign body was present.

The statements made concerning the character of objects is likewise misleading in some cases. In the case of adults the patient may be operated while in a sitting posture. When the light has been turned into the canal, the lumen being held open

[1] See cut of electric head lantern, under exhibition of apparatus and instruments.

by lifting the auricle upwards and backwards with the left hand, the parts should first be inspected without the use of a speculum, since many objects will be found to lie in full view and can be readily turned out with a probe or curette. Should the object lie within the meatus, however, a speculum — as large a one as possible — should be used, when the same instruments may suffice. If any difficulty arises, as is apt to be the case with nervous persons (and nearly always with children), their use is contra-indicated, since the object is liable to be pushed further in. In such cases syringe should be employed, a strong stream of water being thrown into the ear, directed between the object and the canal wall, so that the former shall be carried out of the canal by the return current. The ear should be inspected after each syringeful has been injected, in order that the result of these efforts may be ascertained. Timid syringing is often temporizing and hence ineffectual, serving to impact an object and increase the difficulty. It must, however, be borne in mind whilst syringing with force, that harm may be done by the force of impact unless the water be directed obliquely against the drum-head. This is accomplished by lowering or elevating the nozzle of the syringe, as the case may be, so that its orifice presents towards the canal's wall; otherwise the drum-head may be ruptured.

It is seldom that other means than the above are required unless it be where a bullet has been fired into the ear. The author has himself never seen a case of this kind where it has not been possible to seize the foreign body with forceps, but others have found it advisable to detach the auricle, as recommended by Du Verney in such cases. When this is done it is important to afterwards keep the external auditory canal, at the place of incision, in coaptation by means of dressings introduced therein.

The Management of Difficult Cases.—The cases

which from the frequency of their occurrence and great practical importance are of greatest interest, occur for the most part among children. In these it will often be found necessary to administer an anæsthetic. The patient should be placed supinely upon a table, the operator being seated. This position is not only a comfortable one for the child, but, if the ear be turned downward as much as possible during manipulations, we have the advantage of the tendency of a loose body to gravitate outward. An inspection should first be made without instrumental aid, in order to gain as much knowledge as possible without alarming the patient. In cases where an ordinary loose object lies in the canal, the patient may lie quietly while a delicate probe (Fig. 4)—one improvised by bending a silver probe often does well enough—is employed to gently pull it out, or the author's curette (Fig. 3) may be employed. But, should there be any struggling, one had better desist at once, for fear of pushing the object farther in, although there may be room enough to pass the bent probe or curette between the object and the walls of the canal. The patient may now be forcibly held while a small but strong stream of water is thrown into the ear by a syringe, in the manner described above.

Should the foreign body be found, however, to entirely fill the canal or impacted down in the *cul-de-sac* and thus partly or entirely hidden from view by the eminence forming the isthmus, it is well to begin with the narcosis before making attempts at removal, since a comparatively simple state of things may be converted into a grave one where extraction is attempted in a struggling patient.

Just here it should be stated that in these difficult cases, the first thing to do is to make sure that a foreign body is really present, for in numerous instances, as has already been mentioned above, the ear may be very much injured by efforts to remove a foreign body where none is present.

If, however, the intruder is discovered, and lies against the membrana tympani, or very close to it, we cannot always pass an instrument behind it without danger of rupturing the membrane. The author's experience in these cases is that, since employing his foreign-body forceps, he has been able to remove such bodies by seizing them with the forceps and making traction. Should this be found impossible, owing to tumefaction, rather than rupture the membrane by the use of hooks or curettes, delay is advisable in the majority of cases while attempts are made to reduce the inflammation of the parts; for, when this has been accomplished, efforts at removal may be successful. When the foreign body lies at a safe distance from the membrane, one should, of course, avail himself of bent probes or curettes as well as of the forceps, for they are often more serviceable, and, indeed, in the greater number of cases the foreign body is more easily dislodged in this manner. Should it be found that only by lacerating the canal to some extent can the foreign body be started, we may keep in mind the fact that usually the parts readily heal after very considerable injury has been sustained; and, therefore, if our object can be thus attained and all injury to the middle-ear avoided, we are warranted, whilst the patient is narcotized, in acting with considerable energy. The integument of the canal should, however, only be sacrificed in cases where the operation is sure to be completed, for afterward there will be swelling of the walls of the canal, the foreign body, if left, soon becoming tightly embraced, and the condition of the patient worse than if nothing had been done.

One word in conclusion concerning cases which are brought to the consultant after fruitless efforts have been made at removal. It has often been the writer's experience to find that in such cases the foreign body has been pushed down upon the membrana tympani, which in too

many instances has already been ruptured. The canal in such cases is usually more or less lacerated and swollen. Where the membrana tympani has been ruptured, a discharge takes place from the middle ear, and there is also oozing of blood and serum from the wounded walls of the canal. Under these circumstances the operator must act with much caution, often advising delay, for the patient's friends are now even more urgent than at any previous time respecting the removal of the foreign body.

When accidents of this kind occur, and where the conveniences for giving an anæsthetic and proper instruments are not at hand, the foreign body should be let alone, unless the operator is sure of success, until every emergency has been provided for, notwithstanding the urgent demands usually made by parents and others for immediate action.

A CASE OF AURAL VERTIGO (MÉNIÈRE'S DISEASE) RELIEVED BY EXCISION OF THE MEMBRANA TYMPANI AND MALLEUS.

By Charles H. Burnett, M. D., *Philadelphia, Pa.*

Miss D., aged thirty-one years, consulted me for deafness in her left ear, in November, 1881. She had suffered in childhood from earache and suppuration in the now deaf ear. Gradually the hearing had failed in this ear until it interfered with her avocation of educated nurse. Latterly there has been persistent, loud, high-pitched, and annoying tinnitus in the left ear, with a sensation of confusion in the head. Audition for the voice in the affected ear is now six inches. The tuning-fork is heard best in the left ear, per ossa.

The membrana tympani was white, thick, and flattened, but no cicatrices were visible on it. The pharynx and nares manifested symtoms of hypertrophic catarrh. Treatment of the nares and pharynx relieved the catarrhal symptoms, but the hearing and the tinnitus remained unaffected by the treatment, which was conducted for two months.

The patient then passed from observation for some time, as she removed to another city.

About a year ago she inquired of me whether I could suggest anything for the relief of the tinnitus in the left ear, which had grown much worse, and of the dizziness (aural vertigo) which had been superadded to the other aural maladies, for a year past.

Examination this spring revealed that the malleus was

adherent to the promontory. Membrana tympani white, flattened, but movable under the pneumatic speculum, excepting in the line of the malleus. Hearing about the same, viz., six inches for voice. Tinnitus distressing and distracting; the dizziness had been increasing in frequency and intensity for a year, and was so great at times as to oblige the patient to hold on to a lamp post in the street, for support. Believing the tinnitus, dizziness, and sense of pressure to be due to pressure inward upon the labyrinth fluid from the retraction of the chain of ossicles and the membrana tympani, I suggested excision of the adherent malleus and membrana, which was readily accepted by the patient, and the operation was performed, under ether, May 21st last.

The first step in this operation consisted in excising the upper posterior quadrant of the membrana tympani and revealing the incudo-stapedial joint. The slight hemorrhage was checked by mopping the cut with a five per cent. solution of cocaine muriate.

The same slender blade, slightly curved on its edge, was used to separate the incus from the stapes, and the incus was thereby pushed into the attic where it remained. Then the tendon of the tensor tympani muscle was cut with a round-pointed, double-edged knife, about 2 mm. in diameter, curved laterally. This knife is one proposed for tenotomy of the tensor tympani by Gruber some years ago, and is like that used by J. Orne Green for such tenotomy.

After tenotomy of the tensor tympani, the entire membrana was cut away around its periphery, by means of a straight, probe-pointed knife, devised by Dr. Samuel Sexton, the incision being carried through the suspensory ligaments of the malleus, up to the neck of this bone, both behind and before. The malleus then being seized by slender forceps, was easily removed. Inspection revealed

a strip of bone running from the lower end of the manubrium, toward the promontory, which fully explained the adhesion of the malleus to the inner wall of the tympanic cavity. (The removed malleus was exhibited.)

As soon as the patient recovered from the etherization, she stated that the tinnitus was very much less, and that the sensation of fullness and pressure in the ear had greatly diminished. She remained in bed for twenty-four hours, by my direction; on the third day she went out. The tinnitus was now barely audible and the note had become very much lower in the scale. There was no sense of fullness in the ear, nor was there any tendency to aural vertigo. There was no inflammatory reaction in the wound, nor any bleeding. The hearing was unaltered. The patient remained under observation one week, during which time she expressed herself as feeling the greatest relief in her ear. There was no discharge from the ear, nor any signs of regeneration of the membrana.

Under date of June 4th the patient writes that "though some tinnitus is still heard, she feels better than when she left Philadelphia." There is no sensation of fullness in the ear, which had so long distressed her, nor any vertigo. Under date of June 12th the patient writes that a slight discharge had begun to come from her ear, but that in other respects the benefits of the operation were maintained, *i.e.*, no tinnitus, sense of fullness, nor vertigo annoyed her. Under date of July 13th the patient writes that she has had the ear mopped with two per cent. carbolic acid solution and then insufflated with finely powdered boric acid, at my suggestion, because the discharge had annoyed her, and there had been some pain in the ear.

I am informed by Dr. Randolph, of Baltimore, where the patient now resides, that a new membrane is forming. The patient's further statement is that the noise in her ear is now so trifling that she has to stop to listen to hear it,

so that it practically has ceased. The vertigo has not returned and she further says that "the relieving of either of these distressing symptoms would be sufficient to make me glad to have had the operation performed."

I find nowhere this operation, of excision of the membrana tympani and the two larger ossicles, recommended nor performed for the relief of Ménière's disease, or aural vertigo. It has been performed, however, in cases affected by tinnitus aurium, together with other aural indications for this operation, by Schwartze,* with both temporary and permament relief to the subjective noises in the ear. The nearest suggestion to such an operation for the relief of aural vertigo is made by Politzer, in "Diseases of the Ear," translated by Cassells, American edition, p. 710, which I have read for the first time since my operation. He says: "When the membrana tympani is highly concave, or when there are cicatricial adhesions between the membrana tympani and the inner wall of the tympanic cavity, conditions, therefore, which may indicate an overweighting of the stapes and an increase of the intralabyrinthine pressure as the cause of the symptoms (of vertigo), we should endeavor to diminish the pressure by rarefying the air in the external meatus. . . . Should this manipulation not succeed, or its success not last long enough, then we are justified in trying incision of the tense posterior fold of the membrana tympani or of a tense cicatrix. In several cases I have succeeded in lessening the intensity of an attack by such a very simple operation."

We learn from this case:

1. That tinnitus and aural vertigo may be due entirely to disease in the middle ear, and therefore need not always be referred to disease of the internal ear. The disease of the internal ear in this case still exists, as shown by the deafness; but the tinnitus and the vertigo have vanished.

* Die chirurgischen Krankheiten des Ohres. p. 288.

2. The vertigo and tinnitus were caused by the pressure inward of the stapes upon the labyrinth fluid. This being relieved the vertigo and tinnitus cease because the foot plate of the stapes is free in the oval window.

3. The deafness still existing after retraction of the chain of ossicles is relieved, it is manifest that the deafness is dependent upon another cause, probably upon a lesion in the labyrinth. This may be an atrophy of the nerve fibres, from long continued compression exerted by the compromised lymph in the labyrinth. It is also seen that the fibres which are concerned in audition cease to act sooner than those concerned in vertigo, under the same morbid influences.

4. We also see that nothing but good resulted from the operation performed in this case, and we may conclude that this would always be the result with similar indications. If a discharge sets in after the operation, it is easily checked, and is almost invariably followed by the formation of a new membrane. The latter has no retractive power, however, as it possesses no ossicular connection with the middle ear. Therefore, the new membrane is attended by no return of the vertigo and tinnitus.

NOTE.—I am informed under date of Sept. 5th, 1888, by the patient, that the discharge from the ear ceased entirely by the end of July, and has not returned.

DISCUSSION.

DR. J. O. TANSLEY:—I have been much interested in this paper and should like to ask one question. What is now the condition of the drum? I think that the author did not state whether or not there is suppuration at the present time.

I have now under my care a girl on whom this operation was performed probably about twelve months ago. She has caused me a great deal of anxiety. When she

came to me, I found the whole external canal filled with a polyp of large size. There were at the same time serious brain symptoms. Dr. Agnew saw her in consultation and agreed that the case was a serious one and that the symptoms of brain compression were of considerable importance. I have had her under treatment now for some seven months. I removed all of the polyp and found remaining a portion of the contracted drum united to the inner wall of the tympanum. Above and behind the drum in its cicatricial condition and of course now opening in the canal, I found a localized necrosis which passed upward in the direction of the atticus tympanicus for fully one quarter of an inch. The patient has now been under daily observation for about seven months. Dr. Seguin also saw her and agreed that she had serious brain symptoms. I am happy to say that I have healed the local necrosis and that she is doing well, but there are still some brain symptoms.

It seems to me that this operation is a very severe one and I should hesitate some time before performing it, because of the results that may follow. The localized necrosis in this case seems to be directly attributable to the operation.

Dr. C. H. BURNETT :—It would perhaps be more interesting, if I should at once reply to the questions suggested.

I stated that there had been a discharge in this case which came on two or three weeks after I last saw her. She unfortunately could not remain in Philadelphia. I think that there is still some slight discharge. I may answer the question by referring to another case operated on a week before that reported in my paper. There a slight discharge set in soon after the operation. This continued until the new membrane had formed and then ceased. There were no brain symptoms in either of these cases.

I should say that the case alluded to by the last speaker,

was one on which he had not himself operated, and neither he nor any of us is responsible for the perhaps improper performance of an operation. From the statements made, I should say that the operation had not been fully performed, for he found a portion of the membrane remaining and necrosis in the canal. We cannot argue from the abuse of anything to its use.

I would repeat, as I have said in my paper, that the mere occurrence of discharge and regrowth of the membrana is of no moment, unless we feel that the removal of the drumhead has improved the hearing and that the improvement is due to the opening made. It is then our duty to prevent reproduction of the membrane. This opens up a new field which did not enter into the consideration of my case. There the hearing was not improved. The operation was performed to remove the sense of fullness, the tinnitus, and the vertigo, and as the operation was not undertaken for the improvement of the hearing and as it has not made the hearing worse I have not dwelt upon that point. It was done for a specific object which was attained.

This operation has been spoken of as a dangerous one. I can only say that I have not found it so. No one has yet reported any dangerous results from the operation properly performed. I am forced to ask the gentleman if he has performed the operation and has had alarming results.

Dr. Tansley :—The only reason that I have for feeling nervous about the operation is the case which I have reported. The drum is now in a cicatricial condition and shows a triangular cicatrix just below and at the margin of the necrotic opening.

It seems to me that mere tinnitus is something that the patient can get along with if the operation for its relief is liable to cause necrosis and brain symptoms. The case I

have reported is now supposed to have localized pachymeningitis.

Dr. C. J. Kipp :—I would call the attention of Dr. Burnett to the fact that Lucae has performed this operation twenty-five times for the relief of tinnitus and vertigo. In talking this matter over with him, he said that he had abandoned the operation for this purpose because the results had been unsatisfactory. He, however, had had no bad results. In one case hearing was decreased and in this case the tuning-fork indicated middle ear disease. He abandoned the operation because it was not successful in relieving the symptoms. Schwartze performs the operation only in well marked cases of caries of the hammer.

Dr. Sexton :—I did not hear the early portion of Dr. Burnett's paper, but I judge that it was on the subject of excision for tinnitus and subjective symptoms only. I have myself performed this operation between fifty and one hundred times in the past few years and in quite a number of cases of otitis media catarrhalis there has been decided benefit to the tinnitus and other subjective symptoms. I know of no case in which there has been aggravation. Many of the patients have volunteered the statement that the very distressing sensation of pressure and the mental depression has been relieved where there has been no marked tinnitus. The tinnitus is not always relieved by the operation, although in a considerable number of cases it is. In some instances it has been cured.

The improvement in hearing has been about the same as that which I reported a year ago. In some cases slight, but in many very decided.

Dr. Burnett stated that the drumhead closed in his case. My principal endeavor has been to avoid closure. In a number of cases where closure of the drumhead occurs, the improvement in hearing produced by the operation disappears. By adopting very careful methods in the

operation, I have succeeded in preventing reproduction of the drumhead. As a result the lining of the entire tympanic cavity has been converted into a dermoid membrane, a sort of cicatricial or periosteal membrane from which there is no secretion. In some instances there has been for a short time a small quantity of secretion, perhaps from the Eustachian tube or antrum, but this gradually ceases. In some cases partial reproduction of the drumhead has commenced and here considerable difficulty was experienced in preventing its entire return. I have, however, so far succeeded in all cases in preventing reproduction, by the application of a solution of salicylic acid in ether to the margin of the membrane. A light application to the margin of the opening arrests the proliferation of dermoid cells and after one or two applications the perforation remains open. This treatment has been successful even where only a minute opening has been left. I have received letters from several patients who have gone out of town, who state that everything remains as it was.

A word in regard to the purulent cases to which allusion has been made. I have operated on a number of such cases and they are, on the whole, perhaps the most satisfactory cases, but as this matter is not at present under discussion, I shall only allude to these cases. The gentleman who opened the discussion did not state whether the case that fell into his hands was a purulent one or not. He does not state what operation had been performed. It could scarcely have been a case of excision. I have seen one or two excessively neuropathic cases at the Infirmary on whom the effect of ether was so bad that the operation had to be abandoned; there was rapid collapse. In these cases vertigo had been present for years, but this can scarcely be called a severe brain symptom in the true meaning of the word.

Dr. B. A. Randall :—It occurs to me that in Dr. Tansley's case the operation may have been done for the necrosis. The presence of a polypus of the size he describes speaks of neglect to which I think the result is to be credited rather than to the operation.

Dr. Tansley :—I can not say what the operation was done for. The case had evidently been neglected for several months because the patient did not visit any one.

The point which I desire to raise is that, in doing this operation we are planting a seed which may grow into a plant too large for us to handle. It seems to have done so in this case and it may do so in others.

REFLEX INFLUENCES IN THE PRODUCTION OF NASO-PHARYNGEAL CATARRH.

By Albert H. Buck, M. D., *New York, N. Y.*

In the present paper I propose to call attention briefly to those comparatively remote exciting causes of naso-pharyngeal catarrh, which act—so far as we are able to-day to explain the mechanism of their action—through the intervention of the vaso-motor fibres of the sympathetic nerve. Of the direct exciting causes of naso-pharyngeal catarrh we know very little. Certain kinds of dust and smoke, the pollen of certain plants, the decomposing secretions of the parts themselves or of adjacent organs, and to a certain extent the direct influence of heat, cold, and moisture upon the parts, comprise very nearly the entire list of the direct causes known to us. Of the indirect causes, acting through the vaso-motor nerves, the commonest and best known is chilling the surface of the body. If we might believe certain English and American authorities, affections of the teeth should rank next to chill in order of frequency. Possibly this may be the fact, but it has not fallen to my lot, in actual practice, to see more than a very few cases of which I could say that some dental disturbance was playing the part of a promoter of the naso-pharyngeal catarrh, —or of the aural disturbance, if the case in hand were complicated, as it often is, with an affection of the ear. The fact is that we do not yet possess such trustworthy data in regard to the relative frequency of these indirect causes that we can venture thus to classify them. I will therefore simply enumerate some of those which I have observed in practice.

Irritation of the gastro-intestinal tract is, in not a few cases, a very strong exciting cause of naso-pharyngeal catarrh and of all the aural disturbances growing out of such a catarrh. While in most of these cases the evidence of such a relationship is not clear and well defined, it now and then happens that the patient is able, from a habit of close observation, to give the sequence of his symptoms in such a manner as to practically demonstrate the existence of a causative relationship between the gastro-intestinal trouble and that of the naso-pharynx and ear. Thus, for example, in one instance which came under my observation, the patient, who was about forty-five years of age and had for years been more or less of a sufferer from naso-pharyngeal catarrh, with tinnitus aurium and slight impairment of the hearing, and who, more recently, had begun to suffer from feeble digestion, observed that whenever he indulged in certain articles of food, he would experience abdominal discomfort and at the same time a marked exacerbation of his naso-pharyngeal catarrh. So long as the offending substances were in the stomach, he experienced only a slight sense of discomfort; but after they had left the stomach — that is, in the course of three or four hours after he had eaten — a slightly painful peristaltic movement of the bowels would set in, and simultaneously the secretion from the vault of the pharynx would become unpleasantly active, and the singing in his ears would become troublesome. This state of things would last for an hour, or at the most two hours, and then the abdominal discomfort and the other symptoms named would gradually disappear; or rather, the naso-pharyngeal catarrh and the tinnitus would return to their habitual state of slight and comparatively insignificant activity. These attacks were invariably accompanied by the escape of large quantities of gas from the stomach by eructation, and sometimes by a few qualms of nausea.

This case, it seems to me, affords unmistakable evidence that an irritation of the small intestine may, in the presence of a pre-existing naso-pharyngeal catarrh, excite that affection to greatly increased activity. There are many individuals in whom we have every reason for believing that the gastro-intestinal tract is habitually in a state of greater or less irritation. These persons are usually men between the ages of forty and sixty, and it is a very common experience to find the faucial mucous membrane, in such patients, red and swollen. Can we entertain any reasonable doubt, in these cases, that we are dealing with a naso-pharyngeal catarrh of reflex origin, and that the underlying disease which claims our chief attention as therapeutists is the gastro-intestinal affection?

Reflex influences involving the vault of the pharynx and the ear may emanate, I am convinced, from still more remote organs. A lady, about forty years of age, and otherwise in good health, consulted me for the relief of a distressing tinnitus involving both ears. She had experienced the symptoms of a mild naso-pharyngeal catarrh from time to time during a period of many years. Her hearing had not been affected and there were times when she was almost entirely free from the tinnitus. Her digestion had always been good. I saw her, for short periods, at intervals of a few months, and always succeeded in giving her prompt relief by applying a moderately strong silver nitrate solution, with a mop of absorbent cotton, to the vault of the pharynx, on alternate days. There came a time, however, when these applications failed to give the desired relief. The tinnitus became almost unbearable. I then learned from the patient that she had been a sufferer, for many years, from pain in the pelvic region and back, and that at this particular time she was suffering to a more marked degree than usual. I urged her to consult a specialist in reference to the suspected uterine disease, and

she finally but very reluctantly consented to do so. In this way it was ascertained that the fundamental trouble was a retroversion of the uterus, associated with a chronic subacute parametritis, which, from time to time, under the provocation of too much running up and down stairs, etc., became acute. Under proper treatment the parametritis was subdued, the uterus was restored to its proper position and kept there by means of a suitable pessary, and finally, without any further local treatment of the vault of the pharynx, the tinnitus gradually disappeared altogether. From that time to the present (a period of about one year) the naso-pharyngeal catarrh and the distressing subjective noises have been so slight as to require no farther use of the silver solution.

The case which I have just narrated in outline is the only one of the kind that I remember to have seen. However, it has impressed me with the belief that I shall encounter similar cases not so very infrequently hereafter, and that their apparent rarity in the past has probably been due to the fact that I had not given much thought to the probability of such a connection existing between the two diseases, and consequently did not make any effort to ascertain whether any inflammatory action was going on within the pelvic cavity, or not.

The question may suggest itself to some, Are not the reflex influences already referred to, competent to act as the direct causes of a naso-pharyngeal catarrh? As will have been remarked, I have spoken of them only as indirect causes, that is, as factors which are competent to aggravate and heighten a pre-existing but perhaps more or less latent catarrhal disease. I see no fundamental reason, however, why these reflex influences may not also, in certain cases, play the part of direct exciting causes; but I think it would be almost impossible to demonstrate the correctness of this belief, and therefore I prefer to adopt the view which assigns to them a less independent rôle.

DISCUSSION.

Dr. Tansley :—This is a very interesting subject to me. I have met with a number of cases of young girls who are decidedly anæmic, and in fact are in a chlorotic condition. My attention was called to one cause of this condition by a friend some years ago. He suggested that these cases had constipated bowels. I have found that often to be the case and have come to recognize in the constipated habit a cause for anæmia and chlorosis. I have met with young girls who were really afraid to go to the water-closet because it was thought to be indelicate, and who did not have a movement of the bowels for one or two weeks. Much of the matter which should have been excreted was reabsorbed. I think no one should begin the treatment of a catarrh without inquiring into this particular.

It is difficult to determine the influence of affections of the uterus and its appendages in the production of naso-pharyngeal catarrh. Uterine troubles are very common and so are catarrhal affections. We specialists should try more to be general practitioners and watch these cases carefully, else what may appear to be cause and effect, may simply be coincidences.

Dr. S. D. Risley :—I have been intensely interested in Dr. Buck's paper, not only in the admirable manner in which it has been presented, but also in the subject of the paper itself. It seems to me that while the conclusions presented may be correct, so far as the first case is concerned, there is possibly another explanation than that of reflex influence. I suppose that the members of the Society are familiar with the treatise of Dr. Woakes on pharyngeal catarrh and with his chapter on the pre-catarrhal state. It has come to be generally accepted that pharyngeal disease, tonsillitis, etc., are especially liable to occur in individuals of a gouty diathesis. Pharyngeal disease is one of

the most uniform associations with lithæmia. The very symptoms connected with the digestive disturbance, which have been so graphically described, namely, that it was not when food was in the stomach, but at a later period when the food is undergoing that stage of digestion in which the secretion of the liver plays a part, that disturbances arise, would suggest that the digestive disturbances were due to a more or less pathological condition of the liver. It would seem, therefore, that in this case catarrhal state affecting the pharynx and by continuity of tissue the Eustachian tubes and middle ear, was aggravated by the lithæmic condition present, possibly consequent upon the digestive disturbance.

I am led to insist upon this view the more strongly because I am a like sufferer. Whenever my digestion is deranged, I have more or less trouble with my pharynx, but I am entirely free from this when the digestive functions are properly performed. I throw out this suggestion as one of the possible explanations of the symptoms described.

Dr. Burnett:—There is no doubt that gastro-intestinal irritation does have an influence upon the naso-pharynx. I have seen a number of cases of tinnitus aurium without any deafness whatever, due entirely to dyspepsia. This simply shows that there is a reflex action.

Dr. Buck mentioned an interesting point which I have also observed, although I had attributed it to a different cause. He states that in men between 40 and 60 years of age he had found certain conditions of the naso-pharynx with redness of the fauces. I have seen this but have been disposed to attribute it largely to the habits of smoking and drinking spirits and not especially to catarrh. Occurring chiefly in men makes me suspicious that it is largely due to that cause.

A word in regard to the use of nitrate of silver, reference to which has been made. While the use of nitrate of

silver has done a great deal of good and is still doing a great deal of good in many departments of medicine as a topical application, I think that it is one of the worst that can be applied to the nares or naso-pharynx. Its use is sooner or later followed by sclerosis and atrophy. That I have seen. I admit that nitrate of silver will apparently cure hypertrophic catarrh. This is one of the awkward features of the case. I have seen so-called hypertrophic catarrh cured by the general surgeon by the use of nitrate of silver. The case has passed from his hands but in the course of a year has turned up as a patient of the rhinologist or aurist with a well marked atrophic or sclerotic process in the mucous membrane. I have on that account entirely abandoned the use of nitrate of silver to the nares. I can obtain better results with other agents.

Dr. Sexton :—This discussion seems to call somewhat for personal experiences. I have been much interested in Dr. Buck's paper. I have seen a great many cases in which influence of irritation of the mouth on the ear and probably to some extent on the naso-pharynx, was marked. I am quite surprised that Dr. Buck found this the least frequent of all. Nearly all of us have seen patients in whom the cutting of the wisdom teeth was the whole cause of the ear trouble that was present. I am sure that from the cutting of the first teeth, which is so often associated with irritation of the nose, up to the eruption of the second teeth and their final decay, we have sympathy shown in the throat and especially in the ear. What I particularly had in mind on rising was a case brought to me yesterday. A lady, about 30 years of age, whose ears had run off and on since childhood, was suffering intense pain in the left ear in consequence of oral irritation. There was sufficient evidence of inflammation to account for the severe pain which not only involved the ear but also extended to the side of the head. On looking into the mouth, I found

that a vulcanite plate had been inserted for the purpose of bringing the teeth closer together and this had so pressed upon and irritated the gum and palate that it was in a state of intense inflammation. It looked almost as though boiling water had been applied. There was no pain or discomfort in the mouth, but the trouble in the ear seemed to be entirely due to the irritation produced by the plate. I have seen a large number of cases in which there was intense irritation of the gums and even ulceration and yet the patients would insist that there was nothing wrong in the mouth. This is I think a very common experience. In the vast majority of these cases, the symptoms quickly disappeared after the removal of the source of irritation in the mouth. I have the notes in detail of a great number of such cases.

Dr. Tansley :—I agree with Dr. Sexton in reference to the frequent connection between troubles of the mouth and ear, but I thought that this was so well recognized that it was not necessary to refer to it. There is scarcely a day passes without such cases coming under observation. Those who have bad teeth usually have bad digestion and I have thought that the ear trouble might be due to the latter cause.

In regard to the treatment of catarrh by nitrate of silver I agree with Dr. Burnett. I have not made an application of nitrate of silver for a number of years. In the catarrhs of the pharynx and nose, we have the same conditions as in the eye-lids. The catarrh is nothing more than an increased thickening of the basement membrane, causing hypertrophy of the mucous membrane. The tendency of this diffused connective tissue is to cicatrice, no matter where it is placed. The natural course of all hypertrophic catarrhs is towards an atrophic condition. This is as certain as night follows day. We should therefore not make any applications that will have a tendency to increase this

cicatrization. For this reason in the treatment of all catarrhs, both conjunctival and nasal, I use exosmotic solutions. I treat them by exosmosis and not by cauterization.

Dr. J. F. Noyes :—I am glad that this subject has been brought up, for it is a very interesting one and it leads us to think of the importance of general practice with our special practice. I have always recognized these so-called reflex causes acting both upon the eye and the naso-pharyngeal mucous membrane. I have treated these cases by trying to search out the cause. I have seen these so-called reflex influences proceeding from the uterus. I have sent these cases to specialists who have treated the uterus, and the symptoms referable to the eye and the ear have disappeared. Sometimes a dose of ten grains of calomel with fifteen grains of bicarbonate of sodium has removed the eye symptoms.

A remarkable case came under my notice of a lady who after confinement had a naso-pharyngeal secretion resembling that of hay fever. There was a continual flow of saliva. She wasted away to such an extent that her life was considered to be in danger. She was treated by different physicians for many months without benefit. She then passed into the hands of a gynæcologist who examined the uterus and found there the cause of the trouble. When the uterine trouble was relieved the naso-pharyngeal symptoms disappeared. We must all be more general practitioners and not confine ourselves to the local symptoms.

Dr. Theobald :—I think that Dr. Tansley has in some measure answered the objections raised in regard to the use of nitrate of silver. He refers to the fact that the chronic inflammations of the mucous membrane of the nose are apt to be followed by atrophic changes. It seems to me that that is the explanation of the atrophy in these cases.

It is not the result of the nitrate of silver applied in such strengths as are usually employed. The cicatricial tissue and the atrophy are the result of the long continued inflammation. We might as well say that the cicatricial tissue in granular lids is the result of the application of nitrate of silver, sulphate of copper, etc. It is the result of the long-continued, deep-seated inflammation. I am much disposed to question whether the application of a solution of nitrate of silver, ten or fifteen grains to the ounce, would bring about any sloughing. Indeed I am prepared to say that it would not and we should therefore not have cicatricial formation. My experience with nitrate of silver is much like that of Dr. Buck. I regard it as a most useful remedy if applied as he recommends by means of a cotton carrier to the post-nasal region. It is hardly possible that solutions of the strength of ten grains to the ounce can bring about such conditions as Dr. Burnett has referred to. As I have said, I should be more disposed to refer them to the catarrhal inflammation itself.

Dr. Burnett:—The last speaker has misunderstood my remarks. The atrophic catarrh is seen in only about five per cent. of cases of nasal catarrh. That fact would show that it is not often produced by the use of nitrate of silver. I spoke more of the sclerotic form. There is a difference between sclerosis and atrophy. I said nothing about cicatricial tissue. What I mean to say is that there is a tendency to the production of a sclerotic or an atrophic catarrh. But naso-pharyngeal catarrhs do tend to sclerosis and to atrophy if not properly treated, and I believe that they are hurried into this atrophic and sclerotic condition by the application of nitrate of silver.

Dr. Kipp:—Dr. Theobald has expressed my views in regard to the use of nitrate of silver in these cases. Cocaine reduces the hyperæmia and then the application of nitrate of silver keeps the swelling reduced. The solution

should not be strong and should be neutralized. I have seen none but beneficial results from this treatment. I rarely use solutions stronger than twenty grains to the ounce and then neutralize the application with salt water. We do not get deep eschars from this treatment. Used in this way the nitrate of silver is an excellent remedy in such cases.

Dr. Reeve :—I think the effect Dr. Kipp attributes to cocaine when applied to the nasal passage is due mainly to its action on the erectile tissue in the sub-mucosa, as Dr. Bosworth first pointed out. And as regards the use of nitrate of silver, principally in pharyngeal troubles, I think we should recognize at least two distinct pathological conditions which we have to treat in this region. One is a simple catarrh in which nitrate of silver is very useful, as it is in catarrhal conjunctivitis. The other, of common occurrence in my experience, is the presence of adenoid growths, papillomata, or pure hyperplasia of the cushion on the turbinated bones, in which nitrate of silver is ineffective and apt to do harm. I have used the galvano-cautery-burners and snare for hypertrophic conditions in the naso-pharynx during several years, and have found but little reaction and no resulting otitis.

Dr. Tansley :—My experience with the galvano-cautery has been not entirely satisfactory. I have had excellent results with it on the *anterior* nares, but in affections of that part of the throat which affects the ears, its use according to my experience is contra-indicated. I have made it a point to treat these cases myself. I think that fully one third of my practice consists of naso-pharyngeal cases. The ear will be affected by anything which blocks the lower portion of the nasal cavity, any hypertrophy or deviated septum, any increased thickness of the inferior turbinated bone, any hypertrophy of the posterior aspect of the inferior turbinated bone, which ultimately would

become the post-pharyngeal polyp which we see figured in the older surgeries, but which does not now occur because the trouble is recognized early, and any hypertrophy of the post-pharyngeal tonsil. Any operation that I have ever done with the galvano-cautery on the post-pharyngeal tonsil, the posterior aspect of the inferior turbinated bone, or the vault of the pharynx has almost always resulted in suppurative otitis of one or both ears. I have given up entirely the use of the galvano-cautery in these regions and resort to the Jarvis snare. Under this method, I have never had suppurative otitis occur, although I have had present in some cases previous to operating, sub-acute otitis, that is, a reddened condition of the drum, a little serum in the tympanic cavity, perhaps, and just on the point of breaking out into suppuration unless handled carefully, and yet the operation with Jarvis' snare caused no ill result to the ear, but always benefit. I should like to hear the experience of the Society on this point. I regret to say that many rhinologists and laryngologists regard the troubles in the nose and naso-pharynx as the primary difficulty. They do not know anything about the ear and take but little heed of it. If there is a deviated septum, they will correct it and if there is a resulting otitis, they pay no attention to it. It is this fact which has led me to operate on such cases myself. In straightening a deviated septum, if the patient is under ether, they will go to work and twist it, break it up and replace it and insert stitches to hold it in place, the head being so held that the discharges pass backward into the Eustachian tube and excite otitis. In operating, I always place a piece of cotton in the post-nasal cavity to prevent the passage of the secretions backward. Another important part is thorough cleaning after the operation. I should like to know if the experience of other members is similar to mine in regard to these points.

Dr. H. D. Noyes:—I would confirm what has been

said by Dr. Risley. It has been my experience that the gouty diathesis has a considerable influence over this condition. So common is this that it is almost a routine practice with me in certain instances to find out whether or not the patient has the lithæmic diathesis. I see this not only in naso-pharyngeal catarrh, but also in affections of the external auditory canal. There are certain conditions of an eczematous type which are associated with the lithæmic diathesis. I think it possible that the case reported by Dr. Buck was one in which this diathesis existed. I think that the influence of gout in the pathology of these troubles should not be forgotten.

Dr. Burnett :—There is one point which does come within the scope of the discussion of Dr. Buck's paper, and that is where vaso-motor paresis occurs in the turbinated bones. This is an important distinctive point. It is just such cases, as Dr. Reeve has stated, you can test by the application of cocaine. If the apparent enlargement is overcome by the application, one may operate with the actual cautery with perfect safety. Otherwise my experience coincides with that of Dr. Tansley. Very often I see what may be called rhinologists' otitis media. In their eagerness to operate on the nose, they lose sight of the possible complications in the ear.

I think that Dr. Tansley has correctly sketched out the course which should be pursued. We should first make a careful differential diagnosis. It is the vaso-motor paresis cases that are injured by nitrate of silver and improved by the cautery. The true hypertrophies may be treated by nitrate of silver used as a caustic, but this is so weak that chromic acid is better. In these cases the actual cautery will get us into trouble whether the hypertrophy is in the nares, the naso-pharynx, or in the vault.

Dr. Sexton :—I crave the indulgence of the Society for a moment to refer to some of the important suggestions

made by Dr. Tansley in reference to the application of the actual cautery in diseases of the naso-pharynx. So many severe cases of otitis media seem to be produced by the cauterization of the naso-pharynx that I think it high time attention was loudly called to the matter.

Dr. F. F. Capron :—Coming back to the subject of the paper, I would state that I have seen a few cases of so-called hay fever where the premonitory symptoms were those of indigestion. The patients have complained for one or two weeks before the regular attack, of indigestion and later on the true symptoms have appeared. It seems to us that there must be some relation between the condition of the stomach and intestine and that of the nose, but what the true relation is perhaps none of us know exactly.

A CASE OF POLYPOID ANGIOMA OF THE EAR (WITH THREE ILLUSTRATIONS — MICRO-PHOTOGRAPHS).

By Huntington Richards, M. D., *New York, N. Y.*

The following brief clinical history of a case of polypoid angioma is presented to the Society, chiefly on account of its accompanying illustrations. These illustrations (micro-photographs) were kindly prepared for me by Dr. F. W. How, under the direction of Dr. George C. Freeborn, instructor in histology at the College of Physicians and Surgeons, who made the microscopical sections from which the photographs were taken. No. 1 shows a transverse section through the base of the polyp; No. 2, a similar section through its middle portion; and No. 3, a similar section made near its outer extremity.

The patient, Maggie R., 6 years old, was brought to my clinique at the New York Eye and Ear Infirmary, on Friday, May 4th, 1888, to be treated for a profuse and badly smelling otorrhœa, unaccompanied by pain, and dating, according to the statement made by her mother, only from the preceding February. The child's hearing appeared to be good at the time of her visit to the Infirmary and I am told that it had never seemed defective. No tests for determining how far the hearing might be unilateral could then be applied from lack of sufficient time for such tests on the occasion of her visit to the Infirmary. The discharge was greenish in color; no bleeding from the ear had ever been observed. When 2 years old (that is four

years ago) the child had suffered from an attack of measles accompanied by pneumonia : but the mother was positive in her statement that no affection of either ear had followed this illness or had occurred prior to the appearance of the purulent discharge which began in February. From nasal catarrh the child had long been a sufferer, yet she is not a "mouth-breather" and never had snored at night, although the rattling of mucus in her nose when asleep had often disturbed her mother's rest. Her general health is excellent and her appearance almost robust.

An examination of the affected ear revealed the presence of a polypoid mass of considerable size, almost occluding the lumen of the external auditory canal, and especially attracting my attention by reason of its color, which was a deep purplish red similar to the characteristic color of the blood-cysts which are not infrequently found upon or near the membrana tympani. A considerable portion of the tumor was at once removed by snare, and on the following day the remainder of the growth was in like manner extracted at the Vanderbilt clinic, leaving only a minute fragment or stump of the pedicle, attached, seemingly, to the outer surface of the drum-membrane close to the prominence formed by the short process of the hammer. This stump was cauterized with chromic acid. The drum-membrane was found depressed and of a dull dark reddish color; and, either at the time of this recent operation or a day or two later (Monday, May 7th) when the patient returned to the Vanderbilt clinic, an appearance as of a very minute perforation was seen in the centre of the membrane fully two millimetres distant from the cauterized stump of the polyp. The discharge ceased completely with the removal of the polyp, and the perforation, if it was one, was never subsequently detected. Hemorrhage from the cut surface of the growth was unusually profuse on both occasions of snaring and the snared off portions of the

PLATE 1.

POLYPOID ANGIOMA OF THE EAR. RICHARDS.

Transverse section through base of the tumor.

PLATE 2.

POLYPOID ANGIOMIA OF THE EAR. RICHARDS.

Transverse section through middle of the tumor.

PLATE 3.

POLYPOID ANGIOMA OF THE EAR. RICHARDS.

Transverse section near outer extremity.

tumor lost but little of their dark dull red color after removal. The child's hearing is now excellent, although both drum-membranes are depressed and are both of the dark grayish red color already mentioned. I have urged treatment of the nasal catarrh at the hands of a throat specialist. The removed polyp was pronounced by Dr. Freeborn to be beyond question an angioma, and the accompanying micro-photographs abundantly prove the accuracy of this opinion

A CASE OF "FALSE DRUM."

By Huntington Richards, M. D., *New York, N. Y.*

The rarity of the pathological condition known as "false-drum" and a desire to record, however briefly, the clinical appearances of a very marked instance of this deformity which fell under my observation last spring at the New York Eye and Ear Infirmary, will be, I trust, a sufficient apology for laying before the members of the Society an account of such a case, although the account is rendered painfully meagre in its etiological aspect by the excessive mental obtuseness of the patient, and even more painfully meagre and unsatisfactory in its therapeutic aspect by one of the common exigencies of dispensary practice, to wit., the disappearance of the patient. Moreover, a short-handedness in the matter of clinical assistants at the Infirmary forbade the taking of clinical notes: so that even for the meagre account of the case which I am able herewith to present, I am obliged to rely solely on memory. Nevertheless, the appearances in the case were so striking and my observations, as far as they went, were so carefully made, that I am confident that the impressions retained by my memory are worthy of being put upon record.

The patient, a man about 21 years old, was totally deaf in the affected ear and vaguely recalled an attack of otitis media in that ear occurring in early childhood. The other ear presented the common appearances of otitis media purulenta chronica at the time of his visit to the Infirmary.

On examining the ear which was not discharging I was at once struck by the very unusual appearance of a membrane occluding the canal at a depth from the meatus far less than that of the normally situated drum-membrane and less than that of the perforated membane in the discharging ear. This singular occluding membrane was about five and one half millimetres long in its greater diameter, the vertical, and about five millimetres broad in its less, or transverse, diameter. At all points of its periphery it merged without break into the skin lining the auditory canal: yet it differed from the normal drum-membrane in respect to its color, its shape, the relation of its plane to the long axis of the canal, the character of its surface with regard to the existence of inequalities, its apparent thickness, and lastly (as mentioned above), its depth from the external meatus. In color it varied little, if at all, from the skin lining the auditory canal, so far as its peripheral portion was concerned; but to this dead white tint there was added, as the centre of the membrane was approached, a dark slatey-gray tint suggesting the existence of a dimly lighted empty space back of the evidently semi-translucent diaphragm. In shape the membrane was rather oval than round, its larger axis being nearly, but as I recall it not quite, vertical. The plane of the membrane was at right angles to the axis of that portion of the canal lying between it and the meatus. The surface was perfectly even, showing no trace of an umbo, of folds, nor of a prominence such as would be formed by the short process of a hammer. Its thickness, estimated by its color and by its mobility when touched with a probe, was somewhat greater than that of a normal drum-membrane. Its distance from the auditory meatus could not be very accurately measured by probe, but to the eye was manifestly less than the normal length of the auditory canal. The inflation of the ear by Politzer's method had no effect whatever upon the patient's hearing, nor upon the appearance of the membrane.

Thinking it quite possible that a true drum-membrane existed back of this false one, and in the hope of improving the patient's hearing by removing this barrier to aerial conduction, I made a roughly triangular opening, by paracentesis needle, through the centre of the occluding diaphragm, the incisions (rendered rather difficult by the tissue-paper-like yielding of the membrane) causing the patient no pain, although the cut edges of the tissue were reddened by blood. The opening thus effected was about four square millimetres in area and presented a view *not* of a deeper lying drum-membrane, as I had hoped, but of the easily recognized inner wall of the tympanic cavity, glistening with a scanty mucous secretion, and white, or pale buff, in color. The depth of this inner tympanic wall from the false drum was surprisingly great; and by careful measurement made the next day at our office, by Dr. Buck and myself (a probe and measuring tape being used for the purpose), was ascertained to be no less than 15 millimetres. The patient's hearing was slightly, and only slightly, improved by the operation. He was seen at the Infirmary by my assistant a few days later and the latter tells me that no aural discharge had up to that time been established,—an accident I had feared when I discovered that the true drum-membrane was largely perforated. Since that time he has not returned to the Infirmary; and, as I had not added a mention of the "false-drum" to the diagnosis of "Otitis Media Purulenta Chronica" entered opposite his name on the book of the Infirmary, and did not notice or recall the name on the patient's card, I have been unable to identify the case from among others seen at about the same time, and consequently have been unable to keep track of the man for further observation; a circumstance which I regret not a little.

DISCUSSION.

DR. SEXTON:—I would remark with reference to the last paper that it seemed to me that the title might perhaps be a little misleading. I have seen a number of these cases in the past and I believe that Dr. Buck himself alluded to something of the kind at a previous meeting, where the dermic lining of the canal had from suppurative action become detached and had drawn itself together, producing a diaphragm across the canal. I should hardly consider this a false drum, but rather a false drumhead. The osseous tympanum might be normal anatomically in such a case.

In the treatment of this condition formerly, I have been puzzled as to the procedures that might be of service. Last year, however, a case presented itself in which suppuration had again taken place from cold. The false membrane due to otitis media had been present for some years; there was, in fact, a history of suppuration in early childhood. The newly formed membrane gave way under the pressure of secretions. After the subsidence of active symptoms, it occurred to me that an operative procedure might be of service. I therefore divided the membrane around on a line with the canal, and then removed the incus and malleus from the tympanum, thus clearing up the parts. The bones were in a state of disease. This case, a healthy girl about twenty-two years of age, made a good recovery. The improvement in hearing was decided and there was no reproduction of the membrane. I have made up my mind that it would be proper to operate in these cases for two reasons. In the first place, for the improvement of hearing, inasmuch as the tympanic cavity, which is a good condenser of sound, is thus opened up. And in the second place to prevent the consequence of accumulation in the drum from otitis media, relief being much more difficult where the canal is thus occluded.

Dr. Buck :—The criticism of Dr. Sexton is quite correct. The expression "false drum-membrane" should have been used rather than "false drum."

Dr. T. Y. Sutphen :—I have seen two patients with this trouble. It seemed to me that the condition was due to cicatricial closure of the external canal. Inasmuch as it occurs so far from the normal position of the drum-membrane, would it not be better to classify it as such?

Dr. Tansley :—I have had two or three of these cases, and I take the same view as Dr. Sutphen. I have operated once or twice, but these cases do not remain under observation very long. I would ask Dr. Buck if he thinks that this closure is due to cicatricial contraction.

Dr. Buck :—Some time ago[1] I read before this Society a paper on the "Ultimate Forms of Granulation-Tissue in the Ear," and in it I gave an account of a case of this kind, and explained its origin in this way. I believe this is the true explanation. I think, however, it is wiser to retain the title, as the membrane would easily pass muster as a drum-membrane, although of course it is not a drum-membrane.

Dr. Kipp :—These membranes occur as a result of granulations and I have seen them form under my eye. In treating the membranes I have simply made a crucial incision in them, and then put a laminaria bougie in the opening. Under this treatment the false membranes have disappeared without trouble.

Dr. Mathewson :—I presented at the New York Ophthalmological Society some years ago, a case analogous to the one reported. A lady, whom I had treated for some time for an eczematous condition of the external meatus, after some months' absence again presented herself and I found a disc-like closure of the external meatus. There was no general swelling. There was a small opening in this disc. There had been nothing but the eczema-

[1] 1874.

tous condition. The natural drum-membrane was intact. I dilated this opening with laminaria bougies and the disc-like membrane shrank away and left the ear in a perfect condition.

Dr. Risley:—The remarks in reference to these false membranes furnishes me with an explanation of what was to me a curious condition in a case which I last saw yesterday. The patient came to me the latter part of last week with the ear filled down to the drumhead with a mass of mal-odorous débris. After thoroughly removing the collection, I found possibly one-fourth of an inch from the drumhead a crescentic membrane occupying three-fifths of the circumference of the canal not more than two millimetres deep at the broadest part, and throughout the greater part of its concave border there was a rim of granulation tissue which bled upon the slightest touch. It occurs to me that this crescent was one of these forming membranes. I simply brushed off the granulations and touched the surface with an astringent.

Dr. Theobald:—The members may recall a case which I reported to the Society of a young girl who had occlusion of both external auditory canals. There was simply a shallow *cul-de-sac* in each ear. The septum which closed the canal hardly presented the appearance of cicatricial tissue. Though there was a little suggestion of a cicatrix in its centre, the membrane resembled more the skin of the auditory canal. There was a history of discharge and no doubt there had been ulceration and gradual closure. The septum was near the orifice of the external auditory canal.

Dr. Burnett:—I have seen several cases of these dermoid diaphragms in the canal both in hospital and in private practice. Those which interested me most were the cases seen in private practice. The first instance was seen in quite an old man. This remained imperforate as long as

the patient was under observation. The other cases were perforate when they came to me and there was slight discharge. I succeeded in checking the discharge and the perforation healed. In one case of perforate diaphragm, the discharge remained checked for a short time. The perforation again occurred. I again treated the patient and the opening closed and I think has not since recurred, a period of four or five years. The last case was one seen two years ago. Under treatment the discharge ceased and the perforation closed. It remained closed for a year, when a slight discharge appeared with recurrence of the perforation. After some treatment the discharge again ceased and the opening closed and has remained so. In all of the cases the hearing was lost before the patients came under observation. In the imperforate case there was a history of suppuration in boyhood. There had been otorrhœa when the patient was ten years of age. This had been treated by swabbing with a stick of blue stone. This I think set up the growth of granulation-tissue and led to the formation of the diaphragm.

Dr. Randall :—It may not be mal-apropos to mention a case that I saw last year in a boy of twelve, who at birth was rapidly delivered with the forceps not carefully applied, on account of uræmic convulsions in the mother. It was not noticed at the time that the auricle had been torn partially from the head; but it was discovered and readjusted the following day and a pledget was put in to maintain the patulency of the external meatus. As the child cried, the pledget was removed and the canal allowed to close. There was a certain amount of discharge which escaped through a minute opening in the obstruction and pressure would force a very fetid discharge through the Eustachian tube into the pharynx, often making him sick. I found that the bone conduction on this side was good and considering this an indication for operation, made an incision

and excised the diaphragm. This was at least three millimetres in thickness and consisted of thickened skin tissue with some cicatricial tissue. I found a considerable perforation in the drum-membrane and that chronic suppuration was going on in the cavity. I tried to wash the ear through the Eustachian tube without much success. I dried the surface and insufflated boric powder in the ordinary way with entire success in prompt disappearance of the discharge. A drainage tube maintained the patulency of the canal and when seen a month later the hearing was certainly one-fourth of the normal, with a dry ear, entirely free from all trouble. This result struck me as rather unusual in a case of partly retained purulent discharge of ten years' standing.

THE FLEXIBLE CATHETER AS A DRAINAGE TUBE (WITH CASES).

By J. B. Emerson, M. D., *New York, N. Y.*

In some cases of deep-seated inflammation of the auditory canal or mastoid cells, in which it is necessary to establish drainage through a fistula, we are often much embarrassed by the rapid growth of granulations or by the closure of the fistula by the natural process of healing. I have used the various means for keeping such fistulæ open, and I believe that in the flexible catheter we have a tube which best fills the requirements. While it is sufficiently flexible to be worn with the minimum danger, and with comfort to the patient, it has at the same time sufficient resistance to be easily placed in position, and when in position secures free drainage and by its pressure prevents the growth of granulations or closing of the parts. By using increasing sizes we may enlarge the calibre of the fistula to some extent. Tubes cut from the flexible catheter do not last long, but their cheapness more than offsets this drawback. I have used this form of treatment during the past year in a number of cases with generally satisfactory results. The following cases are briefly submitted:

Case I.—G. S., male, 38 years old, presented himself at the Manhattan Eye and Ear Hospital, Feb. 2d, 1888. About eight years ago he had an acute suppuration of his right middle ear, with pain and tenderness over the mastoid. This was relieved by poultices and hot applications. Some months later he had a return of the trouble, and was

admitted to St. Bartholomew Hospital, London, and treated for six weeks. On his discharge from the hospital the following certificate was given him :

"George Salmon had an overgrowth of the anterior wall of the meatus, obstructing the escape of matter, and leading to grave cerebral symptoms. Sufficient bone was removed by the gouge to give vent to any future formation of matter.

"(Signed,) A. E. CUMBERBETH."

A year ago he had pain and swelling over the mastoid. An abscess formed and was opened by a physician in Washington. Eight months ago the symptoms were relieved and the wound healed. Four months later it reopened and has continued to discharge at intervals ever since. There has also been some discharge at times from the auditory canal.

An examination showed that the auditory canal was filled by a bony growth extending from the anterior wall of the canal. A small probe (Bowman No. 1) could be passed between the exostosis and the posterior wall of the canal. Extending upwards and inwards from the apex of the mastoid was a fistula, $1\frac{3}{8}$ inches in length. Water injected through this passed for the most part into the throat, a small amount escaping through the auditory canal. H. R. $= \frac{0}{40}$. The tuning-fork could be heard through bone, but not through aerial conduction. Under ether, with Buck's drill, and a gouge, I removed the greater portion of the exostosis, making an opening $\frac{3}{16}$ inch in diameter down to the tympanum. A soft rubber drainage tube was inserted. For a month the patient was treated by removing the granulations about twice a week with curettes and keeping the canal thoroughly cleansed with the syringe. The soft rubber tube not keeping the canal open, on March 8th I inserted a tube cut from a No. 6 flexible catheter. When the tube was pressed down to the bottom of the canal, the patient complained of pain on that side of his head and a

tingling on the same side of the tongue. These symptoms were relieved by withdrawing the tube a short distance. By gradually increasing the size of the tube, No. 9 was finally introduced. On March 28th the patient was discharged from the hospital and since then has been pursuing his vocation as a coachman. He has worn his tube constantly and inserts and removes it himself without difficulty. The mastoid fistula has closed. There is still some rough bone in the tympanum, but there has been no trouble from granulations since the introduction of the harder tube.

Case II.—M. Q., a female, 16 years old, came to the Manhattan Eye and Ear Hospital, Feb. 14th, 1888. For some months she had a discharge from her left ear, and recently suffered some pain. H. L. $= \frac{0}{4 0}$; tuning-fork heard through bone, but not through aerial conduction. Examination showed that the sides of the canal were in apposition about $\frac{1}{8}$ inch from the meatus. The canal was red and tender. The patient was placed under ether and a mass of thickened skin and periosteum was removed, showing beyond this necrosis of the bony portion of the auditory canal. For six weeks she was treated daily by Dr. W. H. Way, house surgeon of the Manhattan Eye and Ear Hospital, but in spite of treatment the canal again closed. On March 27th under ether I removed a V-shaped piece of tissue from the canal and inserted a tube cut from a No. 6 flexible catheter. The patient did well until the middle of May, when she ceased to come to the clinics, as she had been doing regularly. She had worn the tube constantly and it had given her no trouble.

Case III.—H. B. M., male, 16 years old, was operated on by Dr. Roosa, March 4th, 1887, for necrosis of the mastoid cells. The patient complained of severe headache. The left ear had been discharging for ten years, and for about three years the mastoid had been implicated, and had been

opened several times with temporary improvement. The auditory canal of the left ear was nearly closed by inflammatory products, leaving an opening which would only admit a small probe (Bowman No. 2). A fistula existed behind the auricle extending about an inch into the mastoid bone. H. D. L. $=\frac{0}{40}$; bone conduction, but no aerial conduction. Dr. Roosa enlarged this fistula and removed caseous material from the mastoid cell, leaving a cavity and fistula over an inch in depth. A tube cut from a No. 9 flexible catheter was inserted. The ear was treated at the office daily for some weeks. During the fall and winter, the patient was treated by a member of his family at his home, who removed the tube and washed out the cavity daily. The discharge lessened, but never ceased entirely. On Feb. 24th, 1888, Dr. Roosa and I decided to try to secure drainage through the auditory canal, by enlarging the existing opening. Under ether I made an opening with a Buck's drill down into the mastoid cells or tympanum, as the parts were so changed as to render it impossible to recognize the landmarks. A tube from a No. 10 flexible catheter was introduced. The patient had no pain that night, but the next day when I removed the tube, had severe pain and vomiting. A smaller tube was put into the wound, but this causing similar symptoms, the tube was removed and a tent was used in its place. This failed to keep the parts open, and in ten days the canal was in the same condition as before the operation. He has since continued to wear a flexible catheter tube in the fistula behind the ear, and has had no headaches or other unpleasant symptoms.

Case IV.—Master J., 6 years of age, was operated on by Dr. Roosa, May 19, 1887, for an acute inflammation of the middle ear and mastoid. The wound was treated with tents, which gave him so much pain that I substituted a soft rubber tube. On July 23d I inserted a tube cut from

a flexible catheter No. 10, which his mother removed daily when she cleansed his ear, *replacing it herself*. January, 1888, the membrana tympani had healed and the discharge continued through the fistula until May 13th, when no rough bone being found the tube was removed and the fistula allowed to close, which it did within a few days, the patient having worn the tube for a period of ten months with but slight inconvenience.

DISCUSSION.

Dr. O. D. Pomeroy.—This seems to be in the line of the investigations which I made some years ago, the results of which are published in the Transactions of this Society. The cases which I reported were those of suppurative otitis in young children with closure of the canal, but with no other changes than swelling. In a large number of cases, this was sufficient to so close the canal that it was impossible to have free drainage, and the patients did not do well. At that time I recommended the use of soft rubber tubing applied in a peculiar manner. The canals were so closed that nothing larger than a No. 3 or 4 Bowman's probe could be passed in. In order to introduce the tube, a probe was passed through it, the tube being hooked to the probe. The tube was then stretched along the probe so as to attenuate it to such a degree as not to add to the thickness of the probe but slightly. After it had been introduced nearly to the tympanum, the probe was removed and the elasticity of the rubber tube caused it to resume as nearly as possible its former size. This was then cut off nearly on a level with the concha. Almost all these cases recovered rapidly. One case returned some months afterward with the tube apparently grown into the part. This was removed and the patient did well. I found that drainage could be accomplished and the ear thoroughly syringed through a

tube of very small calibre. The objection to these tubes is that they are flexible, and the suggestion made by the reader of the paper is a valuable one, as it overcomes that difficulty. It shows invention and adaptation to existing emergencies. At the time that my paper was read, some of the members suggested the use of metallic tubes, but these tubes are too hard. The tube suggested by the reader is a very suitable compromise between these two.

I have seen one or two cases in which the canal was completely closed by bone. One case I reported ten or twelve years ago in which I attempted to remove the bone from the external canal. One reason for the removal was that granulation tissue constantly collected in the canal. I removed some dead bone. From that time to this, the patient has presented a variety of symptoms. Part of the time she has had granulations in the meatus, and she has had headache. Two years ago, I placed her under ether and renewed my attempts to open the meatus. I found that by rather vigorous manipulation, I could pass a strong probe through a sinuous opening towards the tympanum. That encouraged me to endeavor to remove the obstruction altogether. For this purpose, I used a cross-cut bur drill about two or two and one half lines in diameter. I drilled down towards the tympanum at least a distance of one and a quarter inches. I had no difficulty in making the opening. I subsequently cleansed the ear and put in tubes. I sometimes put in laminaria tubes with the idea of dilating the opening, but I utterly failed in keeping it open. I also found that the meatus was quite intolerant of the agents used to favor dilation of the canal.

In the other case of bony closure of the canal, the obstruction was at the commencement of the bony meatus. Outside there was cartilage and a very thin plate of bone. I first bored through with a bur drill and then enlarged the opening with a Buck drill to the size of the normal meatus.

I tried to keep this open, but I failed as badly as in the other case. Any form of dilation employed caused considerable irritation. I then used milder measures, but without success.

I have certainly learned one lesson, and that is, that the auditory meatus does not bear violent treatment. The reaction is apt to induce inflammatory proliferation, which often closes the canal.

I might say that tupelo wood has been suggested as a means of dilation. It is said that it is more apt to dilate symmetrically and to dilate where the stricture is, rather than where it is not. Dr. Tansley has, I think, had some experience in the use of tupelo wood tents.

THREE CASES OF TRANSIENT BILATERAL HORIZONTAL NYSTAGMUS OCCURRING IN CONNECTION WITH PURULENT INFLAMMATION OF THE MIDDLE EAR.

By Charles J. Kipp, M. D., *Newark, N. J.*

Case I.—Chronic purulent inflammation of middle ear, both sides. Acute exacerbation in left ear. Severe pain in mastoid process and head. Intense vertigo. Bilateral horizontal nystagmus lasting four days. Loss of sense of smell. Recovery.

N. E., 28 years of age, was first seen by me Feb. 2. Patient states that his hearing has been poor, and that both ears have discharged from time to time for the last seven or eight years. He has no knowledge of the causes of the otorrhœa. Since three weeks he has intense pain in left ear and in left side of head. Blisters have been applied over the mastoid process and the ears have been syringed by the advice of another physician.

The examination of the left ear shows that the integument of the upper and posterior wall of the external canal, just in front of the drum-membrane, is prolapsed so as to almost close the canal. The drum-membrane cannot be seen. Loud perforation noise on inflation of middle ear on Valsalvian experiment. The skin of mastoid process is excoriated and red, and the lymphatic gland under it is swollen and tender to the touch. Deep pressure in other parts of mastoid process also causes considerable pain.

Only loud speech close to the ear can be heard on either side. (Previous to present attack he heard ordinary con-

versation with the left ear. The right ear has always been very deaf.) The tick of a watch is not heard at all. All tuning-forks (C, C^1, C^2, C^3, C^4) are heard, though indistinctly, through air, and C, C^1, and C^2 tuning-forks are heard from mastoid process as loud and as long as through air. From vertex only the large prismatic tuning-fork C^2 is heard, but he can not tell with which ear.

The right ear is free from discharge in the external canal. Large dry perforation in drum-membrane. The tuning-forks are heard as in the other ear.

A careful examination of the eyes failed to discover anything abnormal in the movements of the globe or in the appearance of the fundus oculi. Vision was perfect.

In view of the pain in the mastoid I thought it best to make at once a long and deep incision in the prolapsed portion of the external canal. No pus, but a considerable quantity of bloody serous fluid escaped from the incision. He was ordered to syringe the ear with a warm 1% solution of salt, twice daily, and to take 10 grains of sulphate of quinine daily. Morphine was given in sufficient doses to produce sleep. Under this treatment the pain in the ear and head gradually subsided, and the integument of upper posterior wall of the canal slowly resumed its normal position.

On the 12th of February there was a return of the pain in the head and at the same time he became very dizzy. He was obliged to go to bed as he was unable to hold up his head. Next day, February 13, he felt somewhat better and came to see me. On the way he noticed rapid movement of the objects in the street and is positive that the objects moved from left to right before his eyes. In looking at distant objects the vertigo increased in intensity and at the same time he had diplopia. On looking at his eyes I saw at once that both eyeballs were oscillating with great rapidity in the horizontal plane and on closer examination

found that the nystagmus was uninfluenced by the fixation of near or distant objects. No diplopia could be made out. The vertigo was so severe that the patient could hardly stand unsupported. No movements of head similar to those of the eyes were observed. There was no optic neuritis. Scanty otorrhœa. The examination of the ear showed still small calibre of inner end of the external canal. Perforation in drum-membrane not visible, but loud perforation noise on inflation of the Eustachian tubes. Water injected into external canal escaped to great extent into the pharynx. Syringing greatly increased vertigo and sometimes caused a sudden jerk of the head towards the side of the affected ear.

February 15. Vertigo and nystagmus continue. Patient thinks that vertigo is most severe on leaving bed in the morning. Since yesterday has nausea, and often vomits after taking food. Is now free from pain in the ear and head, and sleeps soundly. No change in ear.

February 17. Status idem. Thinks that vertigo is increased by lying on his left side (pressure on the ear?). On examination of eyes with red glass before one, the flame of the candle held in front of him was occasionally seen double, the red image being on the same side as the uncovered eye (crossed diplopia). The distance between the images was apparently the same in all parts of the field of fixation. The nystagmus did not interfere with the movement of the eyeball in any direction.

February 19. Less vertigo. Nystagmus continues.

February 21. Much less vertigo. Nystagmus has disappeared. No diplopia. No headache. No nausea. No vomiting. The external canal is now of normal dimensions throughout. In the anterior half of the drum-membrane is now seen a sharply defined, large perforation of irregular form. Loud perforation noise.

February 28. Is now entirely free from vertigo. Hard

syringing of ear or sudden movement of head, however, still causes momentary dizziness. Ear as last stated. No otorrhœa. No pain on deep pressure to mastoid process. The hearing is no better than it was when he was first seen. The tuning-forks are now heard better and longer from mastoid process than through air.

Since a few days he has entirely lost sense of smell. An examination of the nose failed to discover anything abnormal, except slight catarrh of both sides. Otherwise he is now in excellent health.

March 7. Has now a furuncle on posterior wall of canal, close to meatus.

March 12. Furuncle has disappeared. Patient discharged.

July 1. Learned to-day that sense of smell has been gradually restored. His hearing is now nearly as good as it was before this attack. His health has continued good.

The occurrence of oscillatory movements of the eyeballs as the result of purulent inflammation of the middle ear is doubtless a very rare event. The case here reported is the only one that I have seen in more than twenty thousand cases of ear disease, and a somewhat extended search for similar cases in the literature of eye and ear affections has resulted in my finding the two cases below given in abstract. It is very probable, however, that I have overlooked other cases.

Bürkner (*Archiv für Ohrenheilkunde*, *Bd. XIX.*, *p. 249*) reports a case of otitis media suppurativa acuta(?) sin., with caries and meningitis, ending in death, in which rapidly oscillating nystagmus was observed nine days before death. Hearing was totally destroyed at the same time, and on the day after the appearance of the nystagmus the left abducens nerve was found to be paralyzed. The autopsy revealed caries of the petrous bone, absence of the ossicles, and total destruction of the inner

ear. An incision into the pons, immediately below the origin of the tri-facial nerve, revealed an abscess of the size of a cherry, from which yellow pus escaped. The wall of the abscess bulged into the fourth ventricle and occupied more than one-half of it. The trunk of the facial and acoustic nerves could not be recognized as such as it was imbedded in a grayish fleshy mass which extended from the posterior margin of the left petrous bone to the medulla oblongata. In the left half of the cerebellum was found a nodule the size of a cherry, composed of a similar grayish mass interspersed with yellowish spots.

Urbantschitsch (*Lehrbuch der Ohrenheilkunde, Zweite Auflage, Wien, 1884, page 306*) reports the case of a girl in whom the entrance of an insect in the ear was followed by purulent inflammation of the middle ear, in the course of which an uncommonly severe bilateral horizontal nystagmus was developed and still persisted ten years after the ear disease had been cured.

In connection with Ménière's group of symptoms, nystagmus has been observed by J. Hughlings Jackson (*Brain, April, 1879*), Jacobson (*Archiv für Ohrenheilkunde, Bd. XVI., p. 293*), and Gruber (*Lehrbuch der Ohrenheilkunde, Zweite Auflage, Wien, 1888, p. 616*).

Moos (*Archives of Otology, Vol. XII, p. 312*) reports a case of mimic facial convulsions complicated with nystagmus and vertigo. Moos thinks that in this case he probably had to deal with a spasm of the stapedius muscle which accompanied the tic convulsif, and was caused by a labyrinthian irritation from diminished tension. The irritation was transmitted on the one hand to the cerebellum; on the other to the centres of innervation of the ocular muscles causing occurrence of the facial convulsions, together with vertigo and nystagmus.

Case II.—Acute purulent inflammation of middle ear, left side. Large deep-seated abscess below apex of mastoid. Intense vertigo. Transient bilateral horizontal nystagmus caused by injection into abscess. Recovery.

C. K., 28 years of age, came to the Newark Charitable Eye and Ear Infirmary, March 24, to obtain relief of intense pain in left ear. According to his statement both ears had been entirely healthy previous to the present attack. On March 12 he had been exposed to the severe snow storm, and in the night following his left ear became painful. On the following day the pain in the ear was intense and extended over the whole left side of the head. In the evening he first noticed a discharge from the ear. Since then the pain and otorrhœa have continued.

At the time he came under observation he looked extremely ill and was evidently suffering very great pain. The examination of the left ear showed the external canal to be full of pus, after the removal of which the walls of the external canal were seen to be swollen and red, the drum-membrane was of livid color and its dermoid layer macerated. In the posterior inferior quadrant was a small perforation, through which on inflation through the catheter at first much thick yellow pus and then air-bubbles escaped. The mastoid process was somewhat tender on deep pressure. With this ear he could hear only loud speech at a distance of a foot. The watch was not heard. Large C^2 tuning-fork placed on the vertex was heard best in left ear. The tuning-forks were heard when held in front of meatus, but louder and longer from mastoid process. As the opening in the drum-membrane was rather small, I enlarged it. The patient was ordered to syringe his ear with a warm 1% solution of salt several times daily, and as he had not slept for many nights, I gave him morphine at bed-time.

March 25. The pain is as great as yesterday; the morphine failed to produce sleep. I now applied four leeches in front of the tragus, painted the mastoid process with tincture of iodine, ordered applications of ice to the mastoid, and instillations of a warm 4% solution of cocaine. The morphine to be continued.

March 28. No marked change. Pain and otorrhœa as before. Loud perforation noise on inflation.

April 1. Patient has been more comfortable in the day time since last report, but has still much pain at night. Has night sweats. He feels chilly at times, but has had no rigor. There is some redness and swelling of skin over apex of mastoid, otherwise no change. No optic neuritis.

April 7. Since last report the redness and swelling of the skin over mastoid process have gradually extended downwards for nearly two inches and backwards for about the same distance. The parts underneath are now also much swollen and at a point about one half an inch below and posterior to lowest part of the insertion of the auricle, fluctuation can be indistinctly felt. Otherwise the ear is as before noted. An incision about an inch in length and nearly as deep gave exit to an enormous quantity of healthy yellowish pus. A careful examination with the probe failed to discover rough bone. A large drain-tube was inserted into the opening after the abscess had been washed out with a 1:5000 solution of corrosive sublimate, and a thick layer of iodoform gauze and borated cotton placed over the whole region and secured by a bandage. The syringing of the ear and inflation of the middle ear was continued.

April 17. Since the abscess was opened the patient has been almost free from pain. He is now, however, very dizzy most of the time and his gait is so unsteady that he is ashamed to walk the streets. The otorrhœa ceased almost entirely three days ago. The abscess has been

washed out once daily. There is now but little discharge from it and this is now of glairy consistency and of a light yellowish color. The wound is nearly healed. *Today, while I was injecting the corrosive sublimate solution into the opening with perhaps a little more force than usually, I noticed for the first time that the injected fluid escaped from the external meatus. At the same time the patient jerked his head violently to the left and my colleague, Dr. Rankin, who happened to be looking at the man's face, saw a decided but momentary dilatation of his pupils, which was immediately followed by rapid oscillations of the eye-balls in the horizontal plane.* Although I removed the syringe at once, the oscillations continued for several minutes. The man seemed dazed for a few moments and after he had entirely recovered said that when I injected the fluid a darkness came suddenly before his eyes and he felt as if he were falling to the right. He was extremely dizzy, but did not notice any movement of the objects in the room. An examination of the ear showed that the fluid came through the perforation in the drum-membrane. During the next few days the same train of symptoms was produced every time the injection was repeated, and I had therefore ample opportunity to study the movements of the eyes. The dilatation of the pupil preceded the oscillation of the globes only during the first two days. The eyes moved at first slightly to the left and then more extensively to the right. The movement was equally rapid in both directions and of the same extent in both eyes. The ophthalmoscopic examination failed to discover anything abnormal in either eye.

On April 25 the incision was entirely closed, and the perforation in the drum-membrane had healed. Since then the man has been in excellent health and his hearing was at last accounts nearly as good as before the attack.

Case III.—Acute purulent inflammation of the middle ear. Abscess of mastoid cells. Nystagmus caused by pressure on mastoid process. Recovery.

J. C. V., a healthy looking man, 25 years of age, was first under my care six years ago for an attack of acute inflammation of the middle ear, right side, from which he made a speedy recovery with drum-membrane intact and perfect hearing.

On the 5th of April, 1888, he came to me with another attack of the same disease in the same ear. With this ear he heard the watch only on contact. Tuning-forks placed on vertex were heard best in this ear. Bone conduction better than aerial. He had intense pain in the ear and right side of head and had a very sore throat. The drum-membrane was of a dark red color and bulged outward in its upper posterior quadrant. No air entered the tympanic cavity on inflation of Eustachian tube through catheter. I ordered a gargle of chlorate of potassa for his throat; applied six leeches in front of tragus and under the lobule and advised him to fill the external canal frequently with a warm 2% solution of sulphate of morphine. I also prescribed a brisk cathartic and one-quarter grain of morphine to be taken at bed-time.

April 7. Pain as great as before. No change in appearance of ear. Made a free incision in bulging part of drum-membrane, which evacuated a considerable quantity of pus. Loud perforation noise on inflation by Politzer's method. After thorough cleansing of ear, it was covered with corrosive sublimate gauze and borated cotton and this dressing was secured by a bandage.

April 13. Up to yesterday patient was almost free from pain. The ear has been cleansed by syringing several times daily. Profuse discharge of healthy pus. Loud perforation noise on inflation of middle ear. Today he has again pain in ear and head. With exception of a

slight swelling of lower wall of external canal, near drum-membrane, the ear is in about the same state as at last report. The opening in the drum-membrane is large and patent. No tenderness of mastoid process. Ordered more leeches to ear,—three in front and three behind the ear. Also frequent instillation of warm 5% solution of cocaine. The syringing with warm salt water is to be continued. If unable to sleep he is to take fifteen grains of antipyrin.

April 23. Patient has been quite comfortable for several days past. Last night he had pain in ear and right side of neck, which the antipyrin failed to relieve. There is now a circumscribed swelling on the posterior inferior wall of canal; drum-membrane cannot be seen. Loud perforation noise on inflation. The otorrhœa is less profuse. Made a free incision in the swelling in the canal No pus escaped from incision. Examination with ophthalmoscope shows normal state of eyes.

May 5. Was summoned to patient's house, and found him in bed but looking tolerably well. Was told by the patient, whom I had not seen for more than a week, that he had been intensely giddy and unable to walk since I last saw him. He had also suffered much from headache and had had several strange "spells," especially at night. His wife said that these "spells" had lasted several minutes and had ended in unconsciousness of several minutes' duration. These "spells" were probably attacks of syncope. The man is still very dizzy today, but has no pain in ear or head. The examination of the ear showed that the swelling in the canal had disappeared. The perforation was no smaller than it was two weeks ago. Otorrhœa as before. Ordered one-quarter grain of calomel with one grain of Dover's powder to be taken every three hours. The ear to be syringed as before.

May 9. Patient called at my office. Vertigo less intense. He is, however, unable to walk without support. No

change in ear. There is now, however, some redness and swelling of skin over the mastoid process. The swelling is greatest about an inch behind insertion of auricle. Pressure on mastoid causes pain. Stopped calomel as gums began to be affected; painted the swollen region with tincture of iodine and ordered ice to same.

May 12. Patient states that the swelling behind ear continued to increase in size up to yesterday. Last night it was so great that he was hardly able to turn his head to the right. Since then it has gone down very much. Today it is less than it was three days ago. The skin over swelling is now of normal color. Pressure on it causes marked pitting, but little pain. Syringing of the ear greatly increased the vertigo this morning, and, on making Valsalva's experiment, the vertigo almost caused him to fall over. The vertigo was also increased by pressure on the swelling over the mastoid process and by pressing the tragus into the external canal. *This last procedure produced also a marked horizontal nystagmus of both eyes.* The nystagmus continued for a few moments after the pressure had been removed. The movement of the eyes was at first to the left and then more rapidly and extensively to the right. When asked how he felt the patient said that his head and body seemed to be spinning around. He did not observe any displacement of objects in the room. On attempting to turn his head suddenly to the right side he fell over on the left. There is now some swelling of upper posterior wall of canal near drum-membrane. Loud perforation noise on inflation. Water injected into external canal escaped in part through Eustachian tube into nose. Tuning-forks placed on vertex are still heard loudest in right ear. Ophthalmoscopic examination negative. Advised Wilde's incision, but this was declined. Continued application of iodine tincture.

May 15. Was called to see patient, whom I found sitting

up and looking much better. He said that he was again very dizzy and unable to walk about. He had no pain in ear, but during the past night he had had much pain in head and something like an epileptic fit. He thought that he was about to die. He seems to have been unconscious for some minutes. The swelling behind the ear is no greater than it was some days ago. The skin over it is not red. *Pressure on swelling now causes pus to flow from external meatus and at the same time greatly increases the vertigo and produces horizontal nystagmus of both eyes which continues for a minute or two after the pressure is removed.* The oscillations of the eyes are of precisely the same character as those previously produced by pressing the tragus into the external meatus, and the nystagmus can now be produced at will by either making pressure on the mastoid process or by pressing the tragus into the external canal; a very careful examination of external canal failed to discover a fistula in the walls of same.

May 18. Patient had another convulsion last night and has now given his consent to the operation. Under ether, I opened the mastoid process according to Schwartze's method, and after removal of outer cortex found a large cavity filled with pus and granulations. The granulations were removed with sharp spoon and communication established between outer opening and antrum. No pus was found between skin and outer cortex of process.

July 15. Patient has entirely recovered his health. He had a slight convulsion of some kind during the night of June 6, but since then he has been free from pain in ear and head. There has been no return of vertigo and his gait is perfectly steady. He sleeps well and attends to his business. The fistula behind the ear is healed, and the perforation in the drum-membrane closed six weeks ago. The hearing of the right ear is fair and is steadily improving. No attempt was made to produce the nystagmus

immediately after the operation, but some weeks later neither pressure on process or the pressing of the tragus in the canal produced it.

Instances in which nystagmus could be produced in the same way under similar conditions have been observed also by Schwabach and J. Hughlings Jackson, and Bürkner.

Schwabach's communication which was published in the *Deutsche Zeitschrift für practische Medicin, 1878, No. 1*, I have been unable to read in the original, and am therefore obliged to rely for the correctness of the facts below stated upon an abstract of the paper in the *Monatsschrift für Ohrenheilkunde, 1878, No. 7, page 92*. The patient was a man 41 years of age. Discharge from left ear since infancy. Two weeks ago he had severe pain in the ear. Otorrhœa profuse. Hearing greatly impaired. Skin over mastoid process swollen. Pressure on this part causes severe pain. Of the drum-membrane only a narrow rim remains; ossicles not visible. Intense vertigo, which was increased and accompanied by peculiar movements of the eyes such as he had not before observed, when patient pressed on diseased ear. The supra- and retro-auricular regions were greatly swollen. When Dr. Schwabach pressed on these parts, a considerable quantity of thick pus poured from the external meatus; pain was not caused by pressure, *but the moment pressure was made on the mastoid process close to the insertion of the auricle, on a line with the upper wall of the external canal, and also at a corresponding point of the auricle itself, distinct oscillatory movements of the eyeballs were observed. The oscillations were in a horizontal plane to the left (diseased) side and a little downwards. The oscillations ceased the instant pressure was relaxed.* Syringing of the ear produced oscillations less marked. The oscillations were accompanied by vertigo. Alterations in the size of the pupils were not observed. The oscillations ceased with the im-

provement of the ear disease. Schwabach thinks that he can explain the spasmodic movements of the eye-balls by assuming that the pressure exerted on the ear caused an irritation of the semi-circular canals. (See Cyon's experiments at the end of this paper.)

J. Hughlings Jackson's case is published in *The Transactions of the Ophthalmological Society of the United Kingdom, Vol. III., London, 1883, page 201.*

A woman, æt. 49, consulted Dr. Jackson, Nov. 23d, 1882, for giddiness and irregular walking; these symptoms had existed for about three months. She had had disease of the right ear since childhood; at no time had she had noise in it. She had had severe bilious attacks, clearly, by her account, paroxysms of auditory vertigo. There was also a chronic condition, since the so-called bilious attacks she often walked as if drunk. She would sometimes when washing the right ear stumble to the left. She said that pressing on a certain part of the ear (the tragus) made her giddy and produced a disagreeable feeling in her head, "something coming over the brain." *When Dr. Jackson pressed on the tragus he saw her eyes move from side to side*, and she told him that objects "went" from right to left; she did not see them coming back again. She also felt a falling towards the left side. On stopping the pressure the eyes were again still. He could make them move whenever he liked. Mr. Couper saw the case in January, 1883, and found that the jerks were always horizontal towards her right, and equal as well as simultaneously in both eyes. Generally the sharp jerk to the right was preceded by a slower preliminary movement to the left. Movements of widest excursion were obtained when she fixed a distant object above the level of her head. The jerks were shorter when she looked horizontally in front of her, and shortest of all when the axes converged as she looked down at a near object below the level of her

head, and in this last position some rotatory movements were observed. No spasmodic or other abnormal movements of her pupils were detected. Normal acuteness of vision. Dr. Purves examined the ear and found the canal full of pus. There was a swelling on the upper wall of the meatus caused almost certainly by some osseous affection from old otorrhœa of childhood. The ear was, however, so sensitive to interference and the meatus so closed that the actual condition was not determinable at that time. The watch could not be heard in this ear. The tuning-fork was heard one third less when placed on mastoid.

January 11 she felt much better. Dr. Jackson produced no movement by pressing as before, but she could by putting her finger in her ear produce movements of very slight excursion. The discharge from the ear was almost gone. The remedies used were syringing of the ear, and quinine in doses of from two to three grains.

February 27 patient felt perfectly well and had gone back to her professional duties.

With regard to this case, Dr. Jackson says it is needless to do more than mention the now old, but very important experiments of Flourens on the semi-circular canals. This case, like that recorded by Schwabach illustrates very well Cyon's experiments on the semi-circular canals of rabbits. Dr. Jackson supposes that in his patient the pressure made on the tragus was transmitted by the chain of bones to the contents of the semi-circular canals; probably the contents of one or more of these canals was abnormal also. To reach the ocular muscles there must have been a propagation of the changes from the canals, through some part of the nervous system, cerebrum or cerebellum or possibly through both.

Bürckner's case (*Archiv für Ohrenheilkunde, Bd. XXVII., p. 185*) occurred in a girl 20 years of age. Chronic purulent inflammation of the middle ear, right

side. Nystagmus of both eyes followed invariably the introduction of a speculum and syringing of the ear. A careful examination made subsequently showed that even the effort to hear with this ear brought on nystagmus. The patient herself was not aware of the oscillations of the eyeballs. The ophthalmoscopic examination showed normal condition of the eyes.

E. Pflüger (*Deutsche Zeitschrift für practische Medicin, 1878, No. 35,*) has reported a case of chronic purulent otitis media, with formation of polypi on the upper wall of the external auditory canal, very near the drumhead, in which horizontal oscillatory movements of the eyeballs occurred whenever the polypi were touched. He attributes the nystagmus to cerebral irritation.

With regard to the cause of the nystagmus in my own cases I have no other explanation to offer than that given by Schwabach and Jackson.

EXPERIMENTS ON THE SEMI-CIRCULAR CANALS OF THE LOWER ANIMALS.

In a memoir presented to the Académie des Sciences in 1877 (Les organes Peripheriques du Sens de l'Espan, Comptes-Rendus 1877) Cyon described a series of ocular movements and oscillations which he observed on mechanical irritation of the semi-circular canals in rabbits. The great feature of these ocular movements was that the direction was determined by the canal irritated. Each semi-circular canal has a special influence on the ocular movements. Excitation of the horizontal canal in the rabbit produces a rotation of the eye on the same side in such a manner that the pupil becomes directed backwards and downwards. Excitation of the posterior vertical canal causes a deviation of the eye so that the pupil looks forwards and slightly upwards; while irritation of the superior vertical canal causes a deviation backwards and downwards.

The excitation of each canal always causes movements of both eyes, but the movements of the opposite side are contrary to those of the side irritated. The pupil contracts on the side irritated and becomes dilated on the opposite.

Cyon, however, in his thesis Sur les Fonctions des Canaux Semicirculaires, 1878, makes some modification of his statements as to the direction of the ocular movements, particularly as regards those depending on irritation of the horizontal and posterior vertical canals. Irritation of the horizontal canal, he says, causes the globe to be directed forwards and downwards; of the posterior vertical canal, backwards and upwards; and of the superior vertical canal, backwards and downwards. In the other eye the direction is contrary, viz.: backwards and upwards, forwards and downwards, and forwards and upwards, on irritation of the horizontal, posterior, and superior vertical canals, respectively. This discrepancy is doubtless due to the fact that the nystagmus which comes on after the first deviation, which is almost tetanic in character, is apt to mix itself up with the direct effects of irritation and to reverse the really primary movements. The result first obtained by Cyon seems to me more in accordance with other facts than the latter ones. (Ferrier, Functions of the Brain, 2d Edition, page 210.)

The results obtained by Cyon were supplemented and in part confirmed by the experiments of Högyes (Ueber die wahren Ursachen der Schwindelsersheinungen bei der Drucksteigerung in der Paukenhöhle. Pflüger's Archiv für Physiologie, Bd. XXVI., p. 588). This author, on the strength of his experiments, expresses the opinion that the vestibular terminations of the acoustic nerve are a peculiar terminal apparatus which regulates the movements of the eyes and probably the movements of all the muscles subservient to the maintenance of equilibrium, according to the position of the head or the body. For our purpose an

experiment on a rabbit is particularly interesting, in which the perilymphatic liquid was sucked out with a glass tube and air gently blown through the same tube into the perilymphatic space; whereupon bilateral movements of the eye and on more forcible blowing marked nystagmus followed. (Moos, Archives of Otology, Vol. XII., p. 313.)

DISCUSSION.

Dr. Pomeroy:—The paper has referred to the occurrence of epileptiform convulsions in one of these cases. I should like to refer to one case, as surgeons as a rule are not familiar with suppuration of the middle ear as a cause of epilepsy. I had a patient with attacks of epilepsy of the most irregular kind. Neurologists seemed to be completely baffled in the attempt to explain its cause. As the suppuration of the ear was relieved the epilepsy disappeared and there have been no subsequent attacks. I simply call attention to this as it may be a cause of epileptiform convulsions more frequently than neurologists imagine.

Dr. Webster:—I would ask Dr. Kipp if he does not think that this nystagmus is simply an exaggeration of the conjugate deviation that we see, for instance, in cerebral or cerebellar abscess from ear disease. In one case that I saw the eyes would rapidly move to one side, and then suddenly come back to their original position.

Dr. Pomeroy:—The condition referred to by Dr. Webster is different from the rapid oscillation described by Dr. Kipp.

Dr. Tansley:—These cases have interested me, but I have never met with any cases like those detailed. In regard to conjugate deviation in cerebral disease—where this occurs, and the deviation is away from the affected side, the lesion is supposed to be in the cerebellum, and when toward the affected side the lesion is in the cerebrum. I

have had one or two cases in which the diagnosis of cerebellar disease was based upon this point. I have supposed nystagmus to be the result of want of coördination, and that the faculty of coördination is located in the cerebellum. The recovery of the patients does not show that there might not have been some irritation of the cerebellum.

A CONTRIBUTION TO THE ANATOMY OF THE ELEPHANT'S EAR.

By Albert H. Buck, M. D., *New York, N. Y.*

The specimens which I am about to describe were very kindly sent to me for dissection by Prof. Burt G. Wilder, M. D., of Cornell University. The largest of the three represents the greater part of the right temporal bone of the large show elephant, Alice, the mate of the famous Jumbo. It had been sawed out from the skull in such a manner as to show four plane and two uneven surfaces. The plane surfaces are: a horizontal one, which is situated just above the level of the external auditory canal and middle ear, leaving both of them intact, but traversing many of the large air cells which surround these parts; an anterior transverse vertical section, which bisects the anterior end of the middle ear a short distance back of the point where it merges into the Eustachian tube: a posterior transverse vertical section which passes through a communicating system of air cells;[1] and, finally, a median antero-posterior vertical section which leaves one condyle of the occipital part of the occipito-vertebral articulation attached to the specimen. The outer and the lower faces of the specimen represent the natural surfaces of the skull as they appear after the soft parts have been entirely removed. The second specimen contains the entire Eustachian tube of the right side, from its pharyngeal orifice to its termination in the narrowed anterior end of the middle ear. The third specimen consists of the membranous portion of the left

[1]The planes of these two sections form a sharply acute angle with each other, as will be seen by an examination of Fig. 1.

Eustachian tube, divided transversely at a point about five inches from its pharyngeal orifice, and slit up longitudinally throughout a large part of its length. All the specimens are preserved in alcohol.

The external auditory canal.—The auricle had been cut away as close to the skull as possible, and all that remains of the cartilaginous portion of the canal is represented by two overlapping, funnel-shaped gutters of cartilage, which together form a complete conical framework around the skin-lined orifice of the external auditory canal. This orifice, which is nearly circular in shape, measures 9 millimeters in diameter. It enters the skull in a direction nearly parallel with the plane of the horizontal section. At a distance of about 2 centimeters from the orifice, the canal begins to bend downward in its course, and at the same

Fig. 1. Horizontal section of the skull, a little above the level of the external auditory canal. To expose the latter throughout the greater part of its course, the upper wall of the bony cylinder has been chiseled away. (Reduced to one-third of the natural size of the parts.)

time its calibre becomes considerably larger. At a distance of 7 centimeters from the external orifice it measures

15 millimeters in diameter. In the vicinity of the membrana tympani the calibre of the canal again diminishes in size—to 9 or 10 millimeters, as nearly as I could ascertain. The ring of cartilage, representing, so to speak, the insertion of the auricle, loses itself in the cutaneous lining of the canal at a distance of about $5\frac{1}{2}$ centimeters from the outer orifice.[1] The entire length of the canal from the external orifice to the membrana tympani, measures $16\frac{1}{2}$ centimeters, or about $6\frac{1}{2}$ inches. The skin lining the canal, for a distance of about 2 centimeters ($\frac{3}{4}$ inch) from the orifice, presents a finely corrugated appearance, the folds running in a direction parallel with the long axis of the canal. From this point inward, as far as to the drum-membrane, it presents a smooth, almost polished appearance.

As may be seen in the figure, which represents the parts reduced to one-third of their natural size, the cylinder of bone containing the external auditory canal lies in the midst of a labyrinth of inter-communicating cells or chambers of varying size and shape. About midway between the drum-membrane and the outer orifice this bony cylinder lies in front of a cavity of unusual size How far this cavity extends posteriorly I am unable to determine, as the back part of the skull is not before me; but that part of the cavity which is visible in the specimen measures a little over 11 centimeters ($4\frac{1}{2}$ inches) in its transverse, and at least 15 centimeters (6 inches) in its antero-posterior diameter; this latter measurement extending from the surface of the section (posterior transverse vertical section) to the anterior limits of that portion of the cavity which lies in

[1] In this particular specimen the canal was found to be filled throughout its entire length with a semi-solid material which looked like an admixture of cerumen and cast-off epidermis scales. The natural inference was, that the sedentary life and the unwholesome diet (candies, peanuts, etc.) to which show elephants are almost necessarily subjected, had produced this condition of what, in a human being, would be termed eczema.

front of and above the bony cylinder. All these (presumably) air chambers communicate freely with each other, sometimes by very broad openings. So far as I am able to find out by careful exploration with a probe and by forcing smoke through different channels, these cavities do not communicate with the tympanum proper, but, as will be seen farther on, they do communicate at one point with what I have termed the subsidiary tympanic cavity. On the other hand, they apparently communicate directly with the nasal system of cavities. In the human being the mastoid cells do not communicate with the cavities belonging to the nasal system except through the Eustachian tube. In this respect, therefore, the mastoid cells[1] of the elephant differ materially from those of man.

The *Eustachian tube*, from its pharyngeal[2] or nasal orifice to the point where it emerges into the tympanic system of cavities, measures 11 centimeters ($4\frac{3}{8}$ inches). Its nasal orifice, in the present specimen, is more or less mutilated: but it is evident that in its general features and size it resembles very closely the pharyngeal end of the human Eustachian tube. The latter is perhaps a trifle larger, and it stands out more prominently from the surrounding surface

[1] In the human being pneumatic cells are found not only in the mastoid process, but also above the dense cylinder of bone which immediately surrounds the calibre of the external auditory canal,—that is, in the very same locality as that occupied by the cells here under consideration. Hyrtl, in his "Anatomische Untersuchungen über das Gehörorgan des Menschen und der Säugethiere" (Prag, 1845), says that "the pars mastoidea of the temporal bone is, according to Köstlin, wanting in the hippopotamus, the elephant, and the rhinoceros." But this statement probably has reference merely to the absence of a visible bony prominence behind and below the orifice of the external auditory canal, and is not to be interpreted as signifying that these three animals lack the system of communicating pneumatic cells which constitutes the essential feature of the mastoid process.

[2] The specimen is too fragmentary in character to warrant me in drawing any conclusion whatever in regard to the relations of the peripheral end of the Eustachian tube to the nasal and pharyngeal cavities. It is for this reason that I employ the terms pharyngeal and nasal indifferently.

of the mucous membrane. Toward the tympanum the tube ends in a nicely rounded orifice, one side of which apparently corresponds with the termination of the long and thick cartilaginous cylinder, around which the tube is curved, gutter-like. As the specimen had been preserved in alcohol for two or three months I was not able to make out satisfactorily, by simple naked-eye inspection, the exact relations of the different tissues of the tube to each other. At the two orifices the calibre appeared to be small, *i. e.*, simply large enough to admit easily a large-sized probe. A section near the middle portion of the tube revealed at first no calibre whatever, the opposite walls being apparently in perfect contact at all points. By manipulating the specimen, however, these closely applied walls could be made to separate, thus revealing to view a calibre large enough to admit the little and perhaps even the third finger. The top part of a question mark represents fairly well the cross section of the calibre of the tube, when in a state of rest, at a point about half-way between the two orifices. Toward the tympanum the tube does not open directly into the tympanic cavity proper, but into an elongated air chamber, which lies at a somewhat higher level than this cavity, and opens into it through an elongated slit-shaped opening. This chamber commences as a *cul-de-sac* at the orifice of the tube, and gradually increases in height and slightly in breadth, throughout a length of between 4 and 5 centimeters (about 2 inches). Like all the air chambers thus far mentioned, its walls consist of thin bone lined with a smooth mucous membrane. The height of the cavity, at a distance of $3\frac{1}{2}$ centimeters from the orifice of the tube, measures nearly three centimeters ($1\frac{1}{8}$ inch); the breadth varies but does not exceed $1\frac{1}{2}$ centimeter ($\frac{5}{8}$ inch) at any part. The opening from this chamber into the tympanum proper is an elongated slit and presents one or two peculiarities. The edge of the opening, on the side toward the

median line (*i. e.*, toward the promontory), is provided with two odd-looking osteophytes, one resembling a cock's comb, the other a padded drum-stick, such as is used in beating a big bass drum. The slender handle of this miniature drum-stick is perhaps 4 millimeters long and scarcely half a millimeter thick, and at the end of it is a well rounded knob, fully two millimeters in length and about a millimeter and a half in thickness.[1]

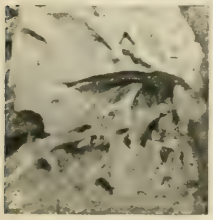


Fig. 2. View of the membrana tympani and arched roof of the passage leading from the tympanum proper to the Eustachian tube. The sharp-edged ridge running along the middle of the arched roof and dividing it into two subordinate shallow inverted grooves or arches, may be seen in the picture. (About one-third natural size.)

Still another peculiarity is observable at the opening which leads from the Eustachian vestibule, if I may so call it, into the tympanum proper. A little below the opening the floor of the vestibule becomes sharply grooved — very much like the groove of bone which, in the human being, holds the belly of the tensor tympani muscle — and runs slightly upward, backward, and inward to the anterior and

[1] Hyrtl says nothing about the occurrence of these osteophytes in the elephant in particular, but he refers to their existence in some animals in the following words: "In certain animals possessing a roomy tympanic cavity there are found, either in the middle ear proper or in some of the cavities which communicate with it, bony outgrowths of characteristic shape. As these objects are found, with rare exceptions, to be always of about the same size and to occupy relatively the same positions, the inference is permissible that they are not mere accidental formations, but probably possess some functional importance. * * * * * * * In the posterior segment of the bulla [tympanica] of the lion these curious structures attain their highest degree of development, and may be seen here in the form of pear- and other-shaped bodies springing by a slender (sometimes hair-like) stem from the floor of this cavity." From this description, and also from the pictorial representations which he gives of these bodies, it is clear that they are identical with those which I have described above.

upper portion of what should probably be termed the annulus tympanicus. As the groove emerges from the opening it becomes a sharply projecting gutter (like those placed under the eaves of houses), and continues as such close up to the top of the membrana tympani. (See Fig. 2.) The roof of the cavity immediately above this gutter, and running parallel with it, is arched, like a second inverted gutter. A low but sharply defined ridge runs along the middle of the arch, dividing it into two minor grooves or arches. The outer one of these two grooves—that is, the one lying farthest from the free cavity of the tympanum proper—is smooth and free from openings throughout its entire length, while the inner one displays three openings —two oval in shape and one nearly circular—which lead into adjacent air chambers. These chambers have no communication one with another, nor with any of the neighboring cavities. The height of the space between the grooved incline and the arched roof is 21 millimeters (nearly $\frac{7}{8}$ inch). The breadth of the grooved floor, opposite the osteophytes, is 1 centimeter ($\frac{3}{8}$ inch).

The tympanic cavity proper.—Looked at from in front, the posterior end of this cavity is shaped very much like that of the human being; all the dimensions being, of course, very much larger. From its anterior portion there branches off, in a posterior direction, a much larger cavity, the long axis of which forms with the long axis of the tympanic cavity a slightly acute angle. The junction of these two cavities converts the promontory into a bold projecting angle of bone.

The roof common to both these cavities presents no features of special interest.

The height of the tympanic cavity, directly abreast of the membrana tympani, is 27 millimeters ($1\frac{1}{16}$ inch) and its average breadth, 25 millimeters (about 1 inch). Its length could not be accurately ascertained, but it must have been at least 50 millimeters (2 inches).

The outer wall is made up of the grooved structures which I have described above, and of the *membrana tympani*. This latter membrane, which is shown fairly well in Figs. 2 and 4, is decidedly conical in shape, as seen from

Fig. 3. View of the tympanic cavity from above and in front, showing (distinctly in the photograph but very faintly in the engraving) the stall-like openings under the floor of the tympanum, a part of the jagged wall surrounding the mouth of the well-like excavation, the two osteophytes and the grooved floor of the passage-way leading from the tympanum to the Eustachian tube. (Slightly reduced in size.)*

the side of the tympanum, while the surface of the membrane on the side toward the external auditory canal presents scarcely any hollowing-out at all,—barely enough to justify the use of the expression, a shallow cone. This lack of agreement between the two surfaces is due apparently to two facts: the marked curving inward of the tip end of the manubrium mallei, and the great thickness of the soft parts in the vicinity of the umbo of the membrane. From the great resistance which the latter offers to pressure made at any point of its surface I should infer that its thickness is at no point less than one millimeter. As a

*The difficulties encountered in photographing the middle ear from different points of view were found to be very great, and as a consequence the half-tone pictures which accompany this article leave very much to be desired in the way of clear definition.

whole the membrane is nearly circular in shape and measures fully two centimeters ($\frac{3}{4}$ inch) in diameter.

Posteriorly the tympanic cavity terminates in a *cul-de-sac* composed of soft tissues, which form a thick diaphragm separating the tympanum proper from a second, much smaller cavity containing the head of the hammer, all of the anvil, and presumably the stirrup. From the lower part of this *cul-de-sac* the chorda tympani nerve passes outward and forward, in the form of a strong rounded cord, across the inner aspect of the neck of the hammer, at right angles to the manubrium. There is apparently no trace whatever of a tensor tympani muscle.

The comparatively small area of bone surface constituting the inner wall of the tympanic cavity, presents, directly opposite the umbo of the drum-membrane, a rounded eminence in which no openings are visible. This is probably the analogue of the promontory in the human being. Below it, and situated more posteriorly, is a rounded ridge of bone which terminates in a hooded opening or niche, suggesting the niche for the fenestra rotunda; but a careful exploration with the probe fails to detect any break in the hard, bony surface at the bottom of the niche.[1] Furthermore, this niche faces forward and inward, whereas that of the fenestra rotunda in the human being faces backward and outward.

The mere use of a probe is not sufficient to determine this question satisfactorily, and I must, therefore, leave it unsettled. The rest of the inner wall of the tympanum, up

[1] Hyrtl (op. cit.) says that the fenestra rotunda, in the elephant, is to be found behind an angular overhanging projection of the promontory, and that the actual opening of communication between the tympanum and the scala tympani is a mere narrow slit. He quotes Cuvier as saying that the fenestra rotunda of the elephant is very small, irregular in shape, and concealed behind a projecting part of the promontory. At the same time he states that Fick (*Ueber das Labyrinth des Elephanten*, in Mueller's Archiv, 1844, p. 431) believes that this opening is the outlet of the aquæductus cochleæ, and that the elephant has no true fenestra rotunda.

to the point where it bends abruptly around the blunt anterior edge of the promontory just described, presents no features of special interest.

The floor of the tympanum, in the vicinity of the promontory, is smooth, but on a line with the anterior edge of the annulus tympanicus, it terminates abruptly in a thick, rounded edge which projects free into the air space. One might compare it to the edge of a semi-circular platform surrounding a deep pit. In this pit, directly under the platform, may be seen three sharp-edged vertical membranous septa, dividing the space into three deeply-shadowed recesses and one shallow *cul-de-sac*, all facing obliquely inward and forward. Taking them in regular order from behind forward I explored each stall with the probe, and found that the first one is a mere *cul-de-sac*, extending to only a slight depth beneath the floor of the tympanum. The second one, which presents the largest opening, has no visible floor, but the latter is found, on exploration with the probe, to lie at some distance below the lower edge of the entrance. The long axis of this stall measures 33 millimeters ($1\frac{1}{4}$ inch) and it runs apparently directly underneath, and nearly in the same direction with, the external auditory canal. By withdrawing the probe a short distance and at the same time causing it to press against the anterior wall of the channel, one becomes conscious that the end of the instrument reaches the free edge of an elastic septum that divides this second stall into two subordinate channels. The long axis of this second subordinate channel measures 30 millimeters ($1\frac{1}{8}$ inch). The third stall is somewhat narrower at the entrance than the one just described. It consists apparently of a single passage without any bifurcations, and measures, from the entrance to its farther end, nearly 70 millimeters ($2\frac{3}{4}$ inches). Its general direction corresponds quite accurately with that of the external auditory canal. The fourth stall has a

length of 52 millimeters (2 inches), and its long axis, whose general direction is outward, forms an angle of about 40° with the axis of the external auditory canal. The floor is lacking close to the entrance, and the space is occupied by a deep excavation from which the probe passes outward and forward into a large chamber that apparently belongs to the system of nasal or frontal cells.

The pit lying in front of the stalls which I have just described, has a honeycombed floor; the comb-like structures rising up to such a height as to partially conceal the entrances to the stalls. One of them is particularly conspicuous by reason of its perfectly cylindrical shape, by the jagged character of its free upper edge, and by the depth (20 millimeters—$\frac{3}{4}$ inch) of the enclosed well, which seems to have no communication with any of the adjacent cavities.

The large cavity which I mentioned in the earlier part of this description as forming a slightly acute angle with the tympanum proper, presents few features of special interest. Its total length is approximately 50 millimeters (2

Fig. 4. View of the subsidiary tympanic cavity from in front, after the removal of the greater part of the anterior and upper boundaries. (Natural size.)

inches); its maximum transverse diameter is 30 millimeters

($1\frac{1}{8}$ inch) and the minimum 20 millimeters ($\frac{3}{4}$ inch). At the lowest point of this subsidiary tympanic cavity are two triangular openings with smoothly rounded edges. The anterior opening leads into the general system of air cells which surround the external auditory canal; the posterior opening leads into a long cavity or system of cavities which (as shown by the smoke test) do not communicate with these cells. A probe introduced into this posterior opening can be passed, in an outward and somewhat upward direction, to a distance of 85 millimeters ($3\frac{3}{8}$ inches) without encountering any resistance. Several other openings are visible along the outer wall of the subsidiary tympanic cavity, but with one exception they all lead into shallow pockets or diverticula. In this single exceptional instance a slightly curved probe can be passed in to a depth of 25 millimeters (1 inch). This small curving cavity is situated in the mass of bone which forms the angle between the tympanum proper and the larger subsidiary cavity, and its farther blind end must lie in close proximity to the cochlea. If the opening in the promontory should prove not to be the fenestra rotunda—and Fick (vide antea) casts a doubt upon this point—I would suggest this curved niche as the next most likely situation for the fenestra rotunda.

We come, finally, to the consideration of the small cavity lying above and behind the tympanum proper, the cavity containing the anvil, the body or head of the hammer, and presumably the stirrup. The plate of bone covering both this cavity and that of the tympanum proper was found to be of considerable thickness, probably at least 5 millimeters ($\frac{3}{16}$ inch) in diameter. This smaller cavity, as we have mentioned before, is entirely shut off from the tympanum proper. It is, roughly measured, about 10 millimeters ($\frac{1}{2}$ inch) square, and its height is probably less. At its highest point, toward the external auditory canal, there is an opening (diameter circa 4 millimeters) through which

the probe can be passed, in an outward direction, a distance of 55 millimeters ($2\frac{1}{4}$ inches) before it encounters any obstacle. By the smoke test it appears that this cavity or channel is a closed sac, having no communication with the adjacent system of pneumatic cells, and therefore not representing, in a physiological sense, the analogue of the mastoid antrum in the human being.

The space between the tegmen tympani and the head of the hammer and body of the anvil, was found to be filled with a mass of soft connective tissue (almost like adipose tissue). Its removal disclosed to view the interlocking malleo-incudal joint. The body of the anvil slightly overtowers the head of the hammer; that is, it is a little nearer to the tegmen tympani. There is quite free play between the two ossicles, both of which, however, may be described as being very solidly anchored in their respective positions. Considerable force may be applied to the handle of the hammer near the umbo of the membrana tympani before any visible excursion of the head of this ossicle can be distinguished. The same degree of force applied to the handle of the hammer apparently fails to produce any motion whatever in the anvil. Direct pressure upon the latter must be of a very decided character before visible motion can be excited in it. A strong membranous capsule spans the space between the opposite edges of the malleo-incudal joint.

The labyrinthine structures and the relations of the stirrup to the surrounding parts were not investigated, as it was found that this could not be done without great risk of seriously injuring the specimen. If permission can be obtained to carry on the investigation, even at the expense of the total destruction of the specimen, a further report will be made in regard to these more intricate anatomical relations.

DISCUSSION.

DR. SEXTON:—It has occurred to me when looking at these animals draw up water through the trunk and also breathing through it, that there must be some provision against the entrance of water into the ear.

DR. BUCK:—An examination of this Eustachian tube will show that it would be difficult for water to pass through it. I have no doubt that it is opened from time to time by muscular action.

VERBAL COMMUNICATIONS.

FURTHER REPORT IN A CASE OF TERATOID.

By Dr. E. E. Holt, *Portland, Me.*

In 1883 I reported a case of tumor of both auricles which was called teratoid. Subsequently I reported that it had grown again. This year it was again removed. The examination is not yet complete, but the pathologist states that it is entitled to be called a teratoid tumor.

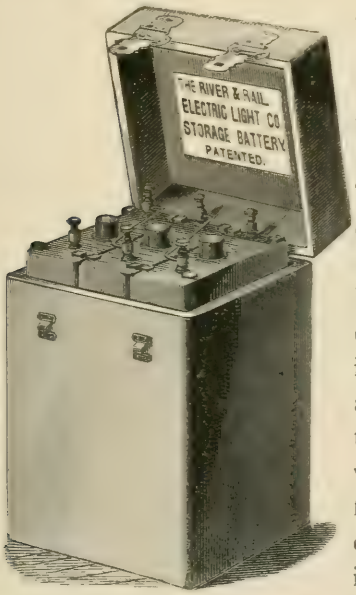
The case is of interest because Dr. Ripley of New York removed this tumor some twenty years ago and after a careful examination regarded it as a simple fibroma. An examination of the tumor removed five years ago showed that it contained almost all of the tissues of the body. This case seems to be a proof that a tumor may change from a simple to a complicated form.

EXHIBITION OF INSTRUMENTS.

A NEW PORTABLE BATTERY FOR THE STORAGE OF ELECTRO-MOTIVE FORCE.

By Dr. S. Sexton, *New York, N. Y.*

A storage battery of three cells made for surgeons' use by the River and Rail Electric Light Company of New York was exhibited. The maximum electro-motor force of each cell of the battery is nearly three volts; the minimum of the three cells in series is about seven and a half volts, the maximum nearly nine volts. The average capacity of each cell is about five ampères, the minimum about seven and a half ampères. The battery is easily portable, capable of lighting a six candle electric lamp, and can also be used for cautery work. This battery will work continuously for twenty-four hours and will remain charged for weeks. I have one in my office which retained its power after several months. I charge the storage battery from twelve gravity cells kept in the basement. The storage cells may be kept continually charged, ready for use, if con-



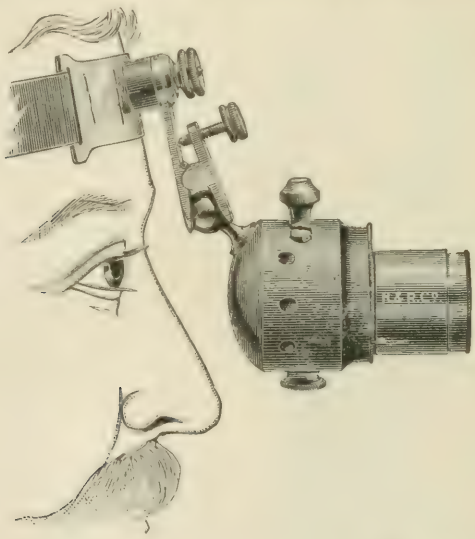
nection is maintained between the gravity cells and the storage cells. The battery may be safely transported to a distance and is ready for use without a moment's delay.

It will be found a valuable acquisition to the aural surgeon when called upon to make an examination or operate at night in the sick room where ordinary light only is employed.

A NEW HEAD LANTERN FOR THE EMPLOYMENT OF ELECTRIC LIGHT IN AURAL SURGERY.

By Dr. S. Sexton, *New York, N. Y.*

This is a modification of the Trouvé lantern. There need be no fear of igniting the ether used in narcosis when this lamp is employed. The lantern is constructed of non-



conducting material, so that there is no danger of burning the nose or forehead from overheating the lantern or its attachment. The lantern may be run with the battery just described.

DISCUSSION.

Dr. Kipp:—I would ask if any of the members have tried to hold the mirror or lamp by the teeth instead of using the head band? This method has been suggested by Lucae and it seems to answer very well.

The President:—Dr. Speir of Brooklyn has suggested something of this kind by which the head band is dispensed with, the mirror being held with the teeth.

Dr. Burnett:—My experience with the storage battery is that it will not give more than six hours' work and that in two or three days it will lose its power whether used or not. It is best filled by a dynamo with a sixteen candle light introduced as a resistance. It may be filled in the way that Dr. Sexton describes, or it can be filled from five to eight Bunsen cells.

Dr. Buck:—Is it found that the actual illumination with the electric light is better than that from a good argand gas burner, or enough better to warrant the expenditure and extra trouble? Different agents have come to my office and shown these different lights and urged their merits. I have tested them and found that the illumination from my argand burner was as brilliant as that from the electric light.

Dr. Burnett:—The advantage of the electric light is in operations where ether is employed. I use gas light for my ordinary office work. I think that the electric light is no better than gas, but the advantage is that it is the only light that can be brought near the etherized patient. In the case that I reported I operated by sunlight, but I had the battery ready to use if the latter grew dim. I found the use of sunlight inconvenient because as I could not move to any extent, in order to catch the sunlight I had to move my body through a much wider arc than if I had used the electric head-light.

Dr. Sexton: — My own experience is that I find myself using the electric light quite frequently. Much more accurate examinations can be made with it than with gas-light, since it greatly increases the illumination of the parts and brings to view things which would often escape notice with other forms of illumination.

Dr. Randall: — In using the electric light, as you do not take the light by reflection, the head has twice the angle of movement, without loss of illumination.

Dr. Theobald: — There is, I think, an advantage in the perforated mirror, in that with it we look through the centre of the cone of light.

Dr. Burnett: — At least fifteen years ago I abandoned looking through the hole in the mirror. It is very hampering. All of my work has been done when looking under the mirror. A great advantage of the electric light is that you have it so thoroughly under the control of the movement of the head.

Dr. Reeve: — One of the main advantages of the storage battery is that one can always have at command a reliable current for the galvano-cautery, which is often necessary in the treatment of naso-pharyngeal affections incidental to aural practice. I have, unfortunately, had to purchase three cautery batteries, and have finally settled on the storage battery.

Dr. Burnett: — This storage battery will heat a needle very well. I have learnt to be very careful in this matter of storage batteries. A friend recently told me that he paid fifty dollars for a French battery which he has not been able to use at all. I have found in my experience that there are many spurious and worthless batteries in the market. For galvano-cautery purposes, I have used a modified form of the Voltolini battery in which the strength of the current is regulated by a treadle.

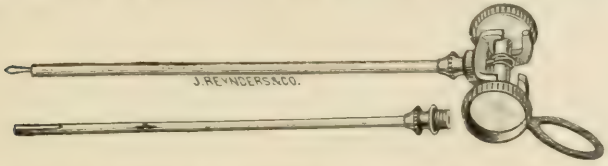
AN IMPROVED AURAL SNARE.

By Dr. J. Oscroft Tansley, *New York, N. Y.*

I desire to show to the Society a new aural snare which has worked well in my hands.

It consists of a delicate canula—in fact its delicacy is only limited by its liability to buckle if too weak—at the end of which there is a bobbin or small windlass made as light as possible.

The bobbin is pierced at its centre, through which both



strands of the snare wire may be passed previous to being wound upon it, or, if desired, only one strand may be passed through this hole and wound upon the bobbin, while the other strand can be made fast by twisting through a hole at the head of the canula near where the bobbin revolves.

The wire used can be of brass, silver, or annealed iron such as is used by the artificial flower makers.

When the polyp is engaged the bobbin is turned slowly or rapidly, as desired,—I generally turn slowly,—and as the instrument is so light I sometimes leave it sticking in the ear and turn the windlass at intervals, gradually cutting off the polyp with little or no pain.

It will be perceived that when the bobbin is turned the force is exerted at each end of the canula and when the wire passes through the polyp there is no sudden jump or jerk of the instrument as is always the case where the force is exerted by the finger or trigger motion, and this is why with my instrument there is so little pain accompanying the operation.

If we take a Wilde's snare and put a piece of raw beef in the loop, then hold the canula point against the back of our hand and with the other hand pull the snare home, if we do it ever so delicately, when the snare cuts through the beef it will suddenly jump and it will be found that the point of the canula has indented itself into the back of the hand, causing considerable pain, and this is why it is so painful in the ear. I have purposely had the handle made small and light to keep the weight of the instrument as little as possible. For the promiscuous use in the clinic I have one somewhat heavier in all its parts. I find that by its use I can snare off the smallest remnant of polyp or granulation with no injury to the underlaying periosteum or tissues, much less painful, better, and safer than can be done with the cutting curette or any other instrument I have used.

DISCUSSION.

Dr. Theobald:—I am sorry that I have not with me an aural snare devised by Dr. Russel Murdoch. The chief objection to the ordinary snare is the drawing motion required of the fingers. In the snare to which I refer, the wire is attached to a double lever, and pressure with the thumb on one arm of the lever tightens the loop. This seems to be the simplest motion that can be made.

Dr. Pomeroy:—I might call attention to the fact that an instrument with two levers, similar to that described by Dr. Theobald, is described in some of the books.

Dr. Tansley:—The objection which I have to the ordinary snare is the snap which takes place when the growth is severed. This is entirely overcome in the improved instrument. In cutting off a large polyp I sometimes occupy five minutes.

ALPHABETICAL INDEX

OF

OTOLOGICAL LITERATURE, FROM JULY, 1887, TO JULY, 1888,

COMPILED BY

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AND

E. D. SPEAR, JR., M. D., Boston, Mass.

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SPECIAL MEETING

—OF THE—

AMERICAN OTOLOGICAL SOCIETY,

—HELD AT—

ARLINGTON HOUSE, WASHINGTON, D. C.,

SEPTEMBER 18, 1888.

Special Meeting.

September 18, 1888.

A Special Meeting of the American Otological Society was held at the Arlington House, Washington, D. C., on Tuesday, September 18th, 1888, at 11 a. m. This meeting took place in accordance with the vote passed by the Society at its Annual Meeting in July, as part of the business of the First Triennial Meeting of the Congress of American Physicians and Surgeons. The President, Dr. J. S. Prout, of Brooklyn, N. Y., occupied the chair.

The following members were present.

Drs. Gorham Bacon	New York, N. Y.
Charles H. Burnett	Philadelphia, Pa.
W. H. Carmalt	New Haven, Conn.
John Green	St. Louis, Mo.
E. E. Holt	Portland, Me.
F. B. Loring	Washington, D. C.
H. D. Noyes	New York, N. Y.
O. D. Pomeroy	New York, N. Y.
J. S. Prout	Brooklyn, N. Y.
S. O. Richey	Washington, D. C.
W. W. Seely	Cincinnati, O.
S. Sexton	New York, N. Y.
J. O. Tansley	New York, N. Y.
S. Theobald	Baltimore, Md.
W. Thomson	Philadelphia, Pa.
J. J. B. Vermyne	New Bedford, Mass.
D. Webster	New York, N. Y.
F. M. Wilson	Bridgeport, Conn.

The sessions of the Society were declared open to the profession and the following gentlemen took part in the discussions:

Drs. J. M. Ray	Louisville, Ky.
Beverley Robinson	New York, N. Y.
R. Tilley	Chicago, Ill.
R. F. Weir	New York, N. Y.

The Society proceeded at once to the reading and discussion of papers, adjourning at 1 p. m. to attend the preliminary meeting for organization of the Congress. An afternoon session was held from 2.30 to 6 p. m.

The following papers were read and discussed:

Dr. S. O. Richey. The Primary Physiological Purpose of the Membrana Tympani.

Dr. Ch. H. Burnett. Chronic Purulent Inflammation of the Tympanic Attic.

Dr. J. Oscroft Tansley Nasal Difficulties in Ear Disease.

Dr. Samuel Theobald. The Employment of Solutions of Boracic Acid in the Treatment of Otitis Media Suppurativa.

Dr. Gorham Bacon. A Case of Cerebral Abscess, following Extensive Necrosis of the Temporal Bone. Operation. Death from Secundary Hæmorrhage. Autopsy. The report was supplemented by interesting remarks by Dr. R. F. Weir, a former member of the Society.

Dr. Samuel Sexton. Excision of the Drumhead and Ossicles, for the Cure of Chronic Purulent Inflammation of the Attic of the Tympanum.

Dr. W. H. Carmalt. Exhibition of Improved Canula Aural Forceps and Scissors.

Dr. O. W. Pomeroy. A Case of Chronic Suppurative Otitis, Resulting in a Metastatic Irido-Choroiditis and an Abscess in the Neck, Remote from the Ear, but Communicating with the Tympanum.

Dr. Clarence J. Blake. Influence of the Use of the Telephone upon the Hearing Power.

Adjourned at 6 p. m.

J. J. B. VERMYNE,
Secretary.

THE PRIMARY PHYSIOLOGICAL PURPOSE OF THE MEMBRANA TYMPANI.

By S. O. Richey, M. D., *Washington, D. C.*

In the development of anatomical structure, special organs, or parts of organs, come into existence as change of environment, or preparation for change of environment, demands them, for the perpetuation of individual existence. Aquatic animals have some peculiarity in various organs, which fits them for the medium in which they live, but these are not fitted for life in the air. Land animals by certain other peculiarities of structure are *unfitted* for existence under water. Amphibia, by organic structure, and therefore organic function, are qualified for both varieties of life.

The young of amphibians spawned in water have branchiæ, the breathing apparatus of the fish; but, with one or two exceptions, adults have lungs instead, the branchiæ giving origin to other needful appendages.

Fishes, living always in the water, have no eyelids. Many of them have movable folds, initial upper and lower lids, while in some sharks a third fold exists, forming a nictitating membrane. Most commonly the integument continues immediately into the cornea.

In reptiles and birds there are an upper and a lower movable eyelid, *and* a nictitating membrane.

In some lizzards and in serpents the eyelids are an annular fold, which becomes a pellucid, or transparent, membrane in front of the eye, *protecting the eye from the external medium*. (Gegenbauer, Comparative Anatomy, p. 532.)

The lachrymal gland appears first in amphibia and

reptiles. In reptiles, birds, and some mammals, the Harderian gland, the secretion of which is not exactly like that of the lachrymal gland, opens under the nictitating membranes, or the pellucid continuation of the integument. These glands are alike in reptiles and birds.

In amphibia, even the efferent duct is foreshadowed by an epithelial development, forming a canal to carry off the secretion of the gland.[1]

The first rudiment of an internal ear is an involution of the integument into a small sac, and occurs among the lower fishes.

The crayfish has a simple auditory arrangement consisting of an auditory sac, or involution of the integument, with fluid contents, a nerve whose filaments enter auditory hairs which project into the fluid contents of the sac. No middle or external ear exists. The lamprey possesses two semi-circular canals and a sacculated vestibule, as an auditory organ. Crocodilia have external ear openings closed by a flap of the integument and this is the earliest suggestion of an *outer* or *drum-membrane* which I can find in the history of the development of animal life. The ears of birds resemble those of crocodiles.

"All amphibia have a fenestra ovalis, with a cartilaginous or osseous columelliform stapes, the expanded proximal end of which is fixed to the membrane of the fenestra." (Huxley.) Many, if not all, batrachians possess a fenestra rotunda; some have no tympanic cavity, though tympanic cavities exist in others, communicating with the throat; and

[1]Naturally here arises a question in regard to the heredity of the hyperopic eye, which is the usual form in the young of the human race. In water, the refraction of which is greater than that of the air, the refraction of the eye needs to be less than in the human being. This is fairly indicated by a comparison between the states of refraction of the eyes in savages and in civilized races; the refraction of the young and adults of civilized races, and the tendency to *increase* of refraction, by heredity and other causes, among the more highly civilized, and hence *older people*.

tympanic membranes exist to which the stapes is attached. The tympanic membrane in the Aglossa is a cartilaginous expansion of the columella. Except the frog, most amphibia have no tympanic membrane. The fenestra *ovalis* only may be found which is connected with the exteriorly situated membrana tympani in the frog by *three* auditory ossicula. In reptiles and birds there is one columella.

The auditory structures are alike in the lowest mammals and birds: they are similar in man and the higher mammals.

To sum up: The eye, the breathing apparatus, and the ear are more superficially placed in the lower forms of animal life inhabiting water. As they approach higher forms, with change of environment, they adopt certain changes of structure better adapted to their exposures.

The eye is protected, in some instances, from the desiccating influence of the atmosphere by a continuation of the integument, that part of which covering the eye becoming transparent: a tear gland is developed, supplying the eye with moisture under this covering. As this structure varies to that of two lids, which, by separating, increase the exposure of the eye, the secretion of tears becomes more than before necessary and the gland becomes more highly developed to supply the more rapid evaporation of moisture. The nictitating membrane in amphibia answers a double purpose of protection,—from the irritating effect of impure water upon eyes accustomed to the lighter medium, air; and from the irritation arising from the rapid evaporation caused by the air.

The breathing apparatus of aquatic animals, the branchiæ, being superficially placed, are, for the same reasons, unsuited to amphibious and land animals. The lungs are centrally situated; air, to reach them, must pass over a considerable extent of moist membrane and is thus ma-

terially modified. Is it not rational that for a similar purpose the auditory apparatus should be fixed farther from the surface of the body and similarly protected?

The denizen of the sea needs no conducting apparatus better than the element in which he moves, for the power of conduction of sound, inherent to the water, is less only than that of solids. Hence, an auditory sac, for the perception of sound, is all that is necessary: and we find him so supplied. The sac is kept in a condition of proper pliability by the water, and this leads us to the purpose of this paper, the important function of the membrana tympani in man.

The delicacy and pliability of the membrana secondaria must be preserved. It is therefore deeply situated, the external air reaching it only after passing over the mucous linnig of the nares, pharynx, and Eustachian tubes, and becoming so saturated with moisture and modified in temperature as not to subtract moisture from the delicate tissues of the auditory apparatus, and lessen their pliability. Is not the chief purpose of the membrana tympani to protect the tympanic cavity from the access of unmodified air in its direction? The whole structure of the conducting apparatus is subservient to the delicacy and pliability of the membrana secondaria; at the same time aiding, and not repressing, the effect of sound waves upon the labyrinthine fluid.

A perforation of the membrana tympani affects *immediately* the function of the organ little, if at all. In time, direct exposure to the air causes gradual change in the structures of the cavity, and, therefore, impaired function. The *smaller* the perforation, the more *gradual* the change; but any opening must have an effect upon the structures of the cavity similar to that of an opening into any other joint capsule, for this is to all intents a large joint.

In Stricker's Physiology, p. 969, we read: "The articulating surfaces of the ossicula resemble other true joints: they have capsules and a layer of hyaline cartilage on the articulating surface. * * * The ossicula in adults are covered by mucous membrane and a very thin periosteum."

Besides, there are other tissues in this cavity, to whose proper function moisture is necessary, and to which the action of unmodified air must prove deleterious,—muscles and membranes.

Though the articulations of the ossicula must be impaired in their movements by the chilling and desiccating effects of the air reaching them so directly, this would not necessarily express itself in impaired hearing, so long as the membrana secondaria is not stiffened, or excluded from the direct impact of sound waves by closure of the perforation in the membrana tympani.

What otologist has not seen cases in which, with an apparently normal condition of the middle ear structures, decided increase of impairment of hearing would follow a cicatricial closure of such perforation, to improve when sufficient time had elapsed to enable the tissues to become pliable from the natural secretion of the lining membrane? When the lining membrane is disabled by disease from producing this necessary moisture, the impairment of hearing is likely to persist.

We will do well to remember that the tympanic cavity is much in the nature of a serous cavity, subject to the same maladies as a joint deprived of its capsule, when the drum-membrane is removed by disease, or otherwise, or when the cavity is exposed by a persistent perforation of the membrane, though not quite so intolerant as a joint.

In amphibia the labyrinth is relatively smaller than in fishes; smallest in the mammalia.

Thus, the nearer to *full* protection from the direct action

of the air, the more developed the tympanic membrane, and the deeper seated the labyrinth, *the smaller is the labyrinth and the less fluid will it contain.*

What is the relation between this fact and the processes of exosmosis from the labyrinth of the fluid contained by it, and evaporation of this fluid? In oto-sclerosis, or when perforation of the membrana tympani exists, profound, almost total, deafness may be due in part to exosmosis and evaporation of the fluid contents of the labyrinth, limiting motion of the perceptive elements by diminution of the amount of fluid in which they float, as well as by anchylosis of the ossicula, or other morbid changes of the middle ear structures.

We find in Gegenbauer's Comparative Anatomy (p. 527), after his discussion of the labyrinth: "Other parts are gradually added, as accessory organs, to the auditory organ, although primarily having no relation to it." By "accessory organs" he indicates the development of the bony tympanic cavity from the first branchial cleft; the involution of the pharyngeal mucous membrane, forming the Eustachian tube; the involution of the integument, forming the external meatus; the formation, at the points of overlapping of these canals, of the drum-membrane: these two tissues, with the *membrana propria developed from the connective tissue lying between*,[1] making up the tympanic membrane. Evidently the development of these structures *subsequent* to the existence of the perceptive organ and *exterior* to it, was with a purpose other than sport. When the simplicity with which nature usually works is considered, we cannot believe it was for the purpose of making the organ more complex. Can we be certain that the existence of a transmitting mechanism improves the perception? A temporary opening of the tympanic membrane, without other tympanic structural change, does not noticeably impair hearing.

[1] Hunt, Trans. Internat. Otol. Cong., 1876, pp. 104–112.

In view of the otherwise guarded position of the labyrinth, it is most rational to suppose the tympanic membrane exists also for that purpose; especially, with the history of the contemporary development of the eye and its appendages, and the lungs with their more central location and appendages and the protection this implies.

This theory of the primary purpose of the tympanic membrane opens up a vast field of aural therapeutics for consideration. In reading aural therapeutics, one must be often impressed with the frequency of *ad captandum* methods, and the sad experiences and failures in manipulating this obscure organ. We see the immediate effect of the air-douche; what is the remote result of its frequent repetition? What was the rationale of the endeavor to maintain an opening of the tympanic membrane in "progressive deafness," when, by proper management, the Eustachian tube could be kept patulous? Much attention has been wasted upon the drum-membrane, instead of its being devoted to the alterations in the structures behind it. The philosophy of surgical violence to this delicate organ, unless in case of destructive disease, is questionable. Nature is wise in her efforts, so persistent, to heal a drum-membrane, whether a perforation is the result of surgical violence or of disease; an effort that would indicate some other object in the existence of the membrane than the transmission of sound waves. If this were not so, why should an opening in the membrane, designed by the surgeon, close, regardless of attempts by eyelets, &c., to keep it open?

My impressions of the advisability of an imperforate membrane are so strong that I have never made one, except to evacuate fluid from the cavity. On the other hand, it has been my systematic practice for more than ten years to endeavor to close such openings. In case of chronic suppuration of the cavity, if the drum-membrane is not restored, the discharge will recur at intervals. In no

case in which the drum-membrane has been restored under my observation, have I learned of a recurrence of the suppuration. This closure of the drum-membrane presupposes the destruction of the pyogenic membrane and of all germinal matter, but it also suggests some other purpose of the drum-membrane than its participation in the transmission of sound waves to the internal ear.

Conclusions.

First. The *primary* purpose of the tympanic membrane is that of protection to the tympanic cavity from the influence of the air: to prevent *parching* and *stiffening* of the membrana secondaria, the joints of the ossicula, the tendons of the tympanic muscles, and to prevent loss of labyrinthine fluid by evaporation.

Second. It, being necessary for protection of the cavity, is modified into part of a transmitting mechanism by the existence of the ossicula and their attachments: a secondary physiological purpose.

Third. A permanent opening of the membrane may, under given circumstances, *temporarily* improve the function of hearing, but is harmful to the ultimate condition of the organ.

Fourth. The tendency of the membrane to heal is an effort on the part of nature to preserve the function of hearing from the effects of disease or ill-advised surgical interference.

DISCUSSION.

Dr. C. H. Burnett:—I would like to ask Dr. Richey to read the second conclusion again.

Dr. Richey:—"It, being necessary for protection of the cavity, is modified into part of a transmitting mechanism by the existence of the ossicula and their attachments: a secondary physiological purpose."

Dr. Burnett:—I think that I but express the feelings of all the members when I say the paper is one of great interest and value and suggestion: and has covered the ground so thoroughly that there is scarcely anything to be said. I think there is nothing to be said in objection to it. I would merely suggest that there is a function of the membrana tympani which we might call antagonistic to the tensor tympani muscle which the doctor has not put in. I thought perhaps he would insert it under the second conclusion. I regard it as of very important consideration in respect to the function of the membrana tympani, certainly very high up in what the writer would call the "secondary function."

There is no doubt that the membrana tympani is primarily a protection from the atmosphere to the mucous membrane; and we would certainly be confirmed in our conclusion by observing how quickly the membrana tympani tends to heal.

So far as surgical interference goes, we learn even there, if we carry it out to its ultimate conclusion, that even in the excision of the membrane, the membrane will form again. I do not think that surgery upon the membrana tympani is entirely barren, however, of results; and there may arise cases where it should be removed surgically and where it could not possibly do any harm to the hearing (the latter already being a good deal impaired); and especially in cases of purulent disease of the tympanic cavity the membrana tympani may be a positive hindrance to our treatment of the purulent disease which becomes the chief consideration.

I infer from the paper that when the Doctor refers to surgical interference he means more especially cases of sclerosis which have been treated by excision of the membrane and in which he thinks that perhaps the organ and hearing are injured. I think that would be the only

exception that I would take to the paper, for I believe that there may arise cases of disease — and I should perhaps limit them to purulent disease in the tympanic cavity — in which the excision of the membrane should be no longer considered as harmful. I mean those cases where the membrana vibrans is not perforated. I refer especially to those cases of perforation of the membrana flaccida and diseases of the atttic to which my paper will refer more especially. With these few slight exceptions I can say that the paper fully accords with the views I have long entertained.

Dr. John Green :—The reader has spoken of the lining membrane of the tympanic cavity as akin in a certain way to a serous membrane. I think we should take care not to lose sight of the fundamental fact that the tympanic cavity is a mucous cavity and that the only membranes which present the characters of serous sacs are the synovial cavities of the articulations of the ossicles. The diseases of the tympanic cavity certainly fall in line with diseases of mucous membranes elsewhere. The whole physiological and anatomical arrangement is that of a mucous membrane,—a mucous cavity pure and simple. I would object to the use of the term "serous" in connection with it, as tending to confusion.

Dr. W. H. Carmalt :—Another point: the mucous cavities and membranes throughout the body are developed from the so-called "external germinal layer," while the serous membranes and cavities are developed from the "middle germinal layer"; the embryological development also is different, so that they cannot be regarded in either an anatomical or embryological sense as homologous.

Dr. W. W. Seely :—One other point the author has made, as I understood it, with regard to the development of deafness in those cases of perforation of the membrana tympani. I think he claimed that there was a fixed

amount of fluid—lymph, for example—in the internal ear owing to the evaporation of which deafness arose. I would like to ask if he means that there is a fixed amount of fluid, not recognizing any communication between the lymph secretion of the internal ear and the general circulation of lymph of the cranial cavity?

Dr. Samuel Theobald:—I am inclined to believe with Dr. Richey that the maintenance of moisture in the drum cavity is an important function of the tympanic membrane, but I am hardly prepared to agree with him that this is its primary and most important function. The intricate structure of the ossicles, the attachment of the handle of the malleus to the tympanic membrane, and the peculiar concavity of the latter, all point to the fact that there is another very important function which the tympanic membrane has to perform. If its chief function were simply to preserve the moisture of the tympanic cavity we should hardly find such elaborate evolution of structure. The primary and most important function of the tympanic membrane, it seems to me, is to aid in the transmission of sound to the labyrinth. If I understood him rightly I should also be disposed to find fault with the comparison which he makes of the tympanic cavity to a joint cavity. The difference between the two, I think, is very wide. The tympanic cavity has a constant supply of air. The joint cavities would be in a bad way if they had a constant passage of air into them.

Dr. R. Tilley:—I think there is no doubt that a considerable number of otologists advocate in a certain class of cases that an advantage is to be obtained, in our present knowledge, from a persistent aperture in the membrana tympani; and I confess that my experience leads me to join with those who think in that particular way. I certainly have got such an improvement of hearing by an excision of a small piece from the membrana tympani,

where the membrane has been considerably thickened, that it is my constant practice at the present time to excise a small piece and to try to sustain the opening. I have in mind two or three cases where I have succeeded so well that from an amount of deafness—in one instance where the watch could not be heard even on pressure and the patient expressed himself in this way: "He was so deaf in that ear that but for cosmetic effect it might be cut off"—on excision of a triangular piece in the lower and posterior part of the membrane the hearing was so improved that the watch could be heard at a distance of six or seven inches. In two cases I have been able to keep these apertures open; and as long as I have kept them open the hearing has been thus far improved. But in other cases where they have closed up the hearing has been lost practically to the same extent as it was before: so that I should differ from the doctor in the discouragement that he seems to throw on such operations. Of course if the membrana tympani is in a normal condition then there is no doubt whatever but that it is desirable to keep it normal without any aperture; but in certain conditions of thickening of the membrane, in my opinion, it is justifiable and profitable to make an opening; and I know no other way at the present time of securing the benefit than by trying to keep it open.

Dr. O. D. Pomeroy:—I do not think it is possible to get a clear and exhaustive notion as to what the membrane is good for in a general way. I remember the discussion of the American Otological Society ten years ago when Dr. Spencer, of St. Louis, reported a case where the drum-membrane became destroyed so that no vestige of it could be found. In this case a new drum-membrane was formed quite complete. After the formation of the drum-membrane the patient's hearing was not as good as before. We had a long discussion as to *what* the membrane was good

for anyway. They thought in many cases it was obstructive to hearing. We all admitted that it was a good thing to close up the tympanic cavity; it did better closed than open. We observed, however, that many tympani remained open a long time and the patient did not suffer. The changes resulting from inflammation alter the original character of the drum-membrane so that you cannot take this as a basis for judgment and reason from that in estimating what the function of the normal membrane should be. You get a new formation composed of cicatricial tissues, the construction of which is not exactly known. Since that time Dr. Blake has made investigations as to the hearing power of patients under different conditions, which were published in the Transactions of the American Otological Society. He applied a great variety of nice tests and demonstrated that a thick drum-membrane was obstructive to the passage of sonorous undulations to the acousticus. The demonstration consisted in puncturing the drum-membrane, when the patient heard better. So there is no question in my mind that the drum-membrane in a state of thickening consequent on inflammation is obstructive to the hearing power.

Another function of the drum-membrane I would like to hear dilated upon. We hear a good deal about the action of the tensor tympani muscle in contracting the drum-membrane for catching one kind of sound and its relaxation for another kind of sound. This I have never seen carefully studied out. That seems to be so and yet nobody has sufficiently studied them. Different tensions of the drum-membrane evidently prepare the ear for different qualities of hearing. That seems to me to be the very reason why we have a drum-membrane, else why do we have that complicated chain of ossicles with all the details for adjusting the tensions of the drum-membrane? Nature, as a rule, does not do anything without an object. This is the

principal function of the drum-membrane in my opinion,—its capacity for preparing us to hear different kinds or qualities of sound by its proper adjustment. We know very well that when we expect a cannon to be fired we adjust our ears for a powerful concussion and it does not rupture the drum-membrane. If a cannon is fired without warning it may rupture the drum-membrane. There, it seems to me, is the principal function of the drum-membrane. I have not studied it out sufficiently to satisfy myself: I don't profess to know much about it.

Dr. Sexton:—I would like to agree with Dr. Burnett and others in expressing my gratification in hearing Dr. Richey's paper, especially the researches he has made in regard to the comparative anatomy of the ear; but I think I should scarcely let the opportunity go by of rather taking issue with some of his conclusions, especially the second. I think we find that in progressive sclerosing catarrh of the middle ear a similar dry condition of the drum is found where the membrane remains intact: and it is in those cases, so far as I am concerned, that the operation of excision of the drumhead is more especially indicated and in those cases it is not entirely the admission of sound to the round window we wish to obtain but the liberation of the stapes from the chain of ossicles.

Now the practical result of operations probably is of some value in coming to a decision in regard to the value of such an operation as excision. I may state, as far as my own observations are concerned, that in a great many of the cases upon which I have operated there has been a transformation of mucous membrane lining the drum into a dermoid dry tissue, but there has at the same time been an improvement in hearing,—perhaps in part due to liberation of the stapes from the chain of ossicles as well as admission of sound to the round window; to which one of these sources of communication with the inner ear the im-

provement is concerned in all cases, we have not well determined. I have several cases under observation in which I have excised a large portion of the drumhead and left the stapes attached to the chain of ossicles. I propose at some time to divide that and ascertain if there is further improvement. If the improvement is simply gained from admitting air to the round window it would be unnecessary to divide that joint.

Dr. Burnett:—Dr. Pomeroy alluded to a subject in my mind,—the meeting of '76 in Philadelphia. At that time I drew attention to a point which the gentlemen present had not observed before. It was in regard to the "isolation," as the physicists term it, of the chain of ossicles maintained by the membrana tympani, as in cases of perforation. I said in discussing Dr. Spencer's paper on "the benefits of the artificial membrana tympani," that I observed in cases of perforation of the membrana tympani that the malleus was undoubtedly drawn in by the power of the tensor tympani; the antagonizing power was overcome and the malleus drawn in in consequence, and that if I would tuck a little cotton ball behind the malleus and draw it out to a normal position, the hearing was improved; and it was maintained as long as I kept the cotton there. The isolation of the chain of ossicles was thus restored and normal vibrations went on. That I regard as one of the highest functions of the membrana tympani in its normal condition, viz.: to maintain the isolation of the chain of ossicles.

Dr. Seely:—The doctor claims that the drawing in of the handle of the malleus and the apparent disturbance of the normal position of the membrana tympani has to do with a diminution in hearing. I would not call in question the statement that he restored the indrawn membrana tympani to its normal plane and thus corrected the depression of the handle of the malleus, but I am not prepared to agree with him that such restoration was the prime factor in

restoring the hearing, simply because every one must have seen cases where the depression was extreme and yet the hearing is perfect so far as all tests show. Hence there must be something more than the altered plane of the membrane to account for these cases.

Dr. Burnett:—I have never seen a very retracted malleus with perfect hearing. I thought the doctor was going to say he had seen cases where the retracted malleus was restored but the hearing was not. I think such an occurrence might be accounted for in many ways: (a) If the malleus is retracted and carries the ossicles with it then the deafness is due to inward pressure of the stapes upon the "contents of the labyrinth." If anchylosis has not taken place by the time the surgeon restores the isolation of the chain of ossicles, the stapes comes out to the normal position when the retractive force is taken off. (b) The reason that hearing is not improved in other cases in which the malleus is restored to its normal position is because anchylosis has taken place between the incus, the stapes, and the oval window, the malleus remaining free.

Dr. Seely:—On the contrary the point is that you may restore the hearing perfectly so far as we can see and the appearance of the indrawing of the malleus is precisely the same as before you began your treatment. I would say there must be something else to explain this condition of things. I have seen more than one case where the appearance of the membrana tympani was not altered in the slightest and yet I know there was indrawing of the malleus, that it was indrawn thoroughly and remained so, although the hearing was, as I say, practically absolutely perfect.

Dr. Pomeroy:—I have been caught in that dilemma quite a number of times. During the winter, in the course at the Policlinic I attempt to define in great detail the appearance of a perfectly normal drum-membrane and to

differentiate it from a diseased one. In spite of all the most exact observation possible I occasionally find signs of sunken drum-membrane in certain cases where the hearing is perfect. My only explanation is—that at some previous period the membrane was sunken and all the characteristics of this condition were present, including the exaggeration of the folds of the membrane. When perfect restoration took place some of these folds left ineffaceable markings. This point may be further illustrated thus: the crushing in of a stiff hat would undoubtedly leave markings which on restoring to its original shape would be likely to be still more or less noticeable.

Dr. Tilley:—My experience corresponds exactly with the experience of those who claim to have observed an in-drawn and distorted membrane, associated with practically good normal hearing.

Dr. Richey:—My language in reference to opening the drum-membrane was (reading from the paper): "The philosophy of surgical violence to this delicate organ, unless in case of destructive disease, is questionable,"—by which I refer to suppurative processes. In such cases we must reach the seat of the disease through the drum-membrane or otherwise.

I did not say "the middle ear cavity is a serous cavity." (Reading from the paper): "The tympanic cavity is much in the nature of a serous cavity." As the paper was to be read to men who are familiar with the subject, I did not think it necessary to go into details. The secretion of the tympanic cavity is not like the mucous secretion elsewhere: it is thinner, because of the serum. When, in inflammatory excitement, the secretion is increased and we evacuate it through the membrane, it is almost always serum.

There is no fixed amount of secretion in the labyrinth, more than there is in the mouth or elsewhere. It is chang-

ing all the time. In the process of atrophy where the calibre of the Eustachian tube is much enlarged and the nares and pharynx too dry to supply moisture to the air entering the middle ear cavity in this direction, there is still evaporation and the middle ear becomes dry. There is probable movement of labyrinthine fluid towards the middle ear cavity to supply the moisture evaporated. In my opinion to this is sometimes due this gradual and progressive deafness we find in such cases, because there may exist no locking of ossicular joints; the drum-membrane is usually clear and pearly, with no change in shape from the normal,—conditions nearly always found in the early stages of this affection. Still there *is* great impairment of hearing, and I think this the most natural explanation.

Dr. Tilley believes in opening the drum-membrane. The immediate effect is probably an improvement. I would like to know for how long a time he has observed such cases. In simple perforation of the membrane or in ulceration, we know that there is progressive impairment. We see it, not in a week or a month, but in a *few years* changes have taken place in the *function* of the organ, and for that reason I think it better to close up the membrane. Dr. Pomeroy cites an instance in which the whole of the drum-membrane was absent with no impairment of hearing. "Exceptions prove the rule." I think he would not find such conditions very often. It is an isolated instance. He wants "to know what is the use of the drum-membrane anyhow." I claim that its *use* is to preserve the natural conditions of the tissues of the middle ear cavity. Nature made these in a certain way, and the membrana tympani protects them from abnormal influences. Probably, if none of us had a drum-membrane we might in time have some other tissue which would answer the same purpose. We know that nature *does* adapt us to our surroundings. In dry catarrh we have the dryness

first in the nares and pharynx. I think we must go much farther than the mere locality for the pathogeny of this condition. It probably is due to some influence upon the nervous system, exerted by habits of life, or disease elsewhere, and reflected to this point. We see this in hay fever. Why should not atrophic processes have a similar origin? The enlarged Eustachian tubes are due to atrophy or to sclerosis of the lining membrane, and the air passes through them freely. It is not so rapid as with an opening in the drum-membrane, yet there is a certain amount of evaporation going on in the cavity. In this way we may explain the fact that so many of these cases make rapid progress: change in function is perceptible in a short time; then for years we see no change at all in the function of the organ. Applications to the middle ear cavity, which have a tendency to increase the secretion of the lining membrane, lessen the evaporation of fluid from the labyrinth. Upon this idea my theory of the treatment of this trouble by stimulation and increasing the secretion of the lining membrane is founded.

Dr. Sexton:—I would like to read a case. It is from the advance sheets of my work on the ear, now in press. Case 30. Female, 27 years of age, had been suffering from deafness in the right ear for some two years past, accompanied by tinnitus. The operation undertaken on November 11, 1886, consisted in making a large opening with sulphuric acid in the posterior segment of the right drumhead and dividing the incudo-stapedial joint. To prevent reunion of the latter, the attached end of the long process of the incus was amputated. The parts healed up quickly, leaving a large opening in the drumhead through which the lower end of the long arm of the incus and the stapes could now be plainly seen. The patient could previously hear shouting only in the right ear at twenty feet as noise; she can hear now ordinary voice

beyond twenty feet. There is general improvement in the health of the patient and the tinnitus ceased immediately after the operation. That case is now in as good condition as at the time of the operation—November, '86.

Dr. Richey :—That is probably one of those exceptional cases. It seems so to me. How many of them have you seen?

Dr. Sexton :—I have reported here some half dozen cases of that kind. I tabulated these some six months ago. I do not at this moment know how many I have seen. That is an exceptionally good result. I have seen good results that have remained when last seen after the operation one or two years.

Dr. Richey :—There is in human beings a difference in their power of resistance, and we may find under exposure to exceptional influences a power of *exceptional* resistance in a limited number of cases. I would like to know the final result in the case mentioned by Dr. Sexton. Such experience, if general, would very much modify my opinion. While I have the floor I would like to make a suggestion in answer to Dr. Pomeroy in regard to the tympanic muscles. It has never been my impression that the purpose of the tympanic muscles is alone to increase or modify the hearing power; but that they are intended as a help to the drum-membrane, in resisting compressed air from without; in other words, if one be standing near a cannon and *knows* it is going to be fired, he will probably not have a ruptured drum-membrane, nor the stapes driven into the oval window: but if he is not prepared for the explosion he can not adjust the drum-membrane. This adjustment is an involuntary process, just as closing the eyelids for protection to the eye. We know that the membrana secondaria is intended to permit motion in the labyrinthine fluid in response to the motions of the stapes. If a sound wave contributes a certain amount of motion to the stapes,

this puts in motion the fluid of the labyrinth, and the membrana secondaria moves to allow this motion; whereas if the membrana secondaria is stiffened the movement of the fluid is lessened and there is less motion of the foot of the stapes, with a greater tendency to anchylosis. I think this is the way, probably, in which many of our cases of stapedial anchylosis occur. I also think rheumatic arthritis has much to do with that.

Dr. Burnett:—I should like to ask whether Dr. Richey really means evaporation to or from the labyrinth? Now, osmosis might take place; but I don't think the gentlemen present can admit that evaporation as such can take place from the labyrinth by way of the tympanic cavity when the latter is open. The labyrinth is an air-tight cavity.

Dr. Richey:—I think the gentleman would have to prove that through the membrana secondaria there is no possibility of such a passage. In most membranes of the body we find that it is so. We know this tendency in membranes of any kind, even if almost fibrous, that if dry on one side, with fluid on the other, the fluid is apt to pass through.

Dr. Burnett:—That is osmosis, but not evaporation.

Dr. Richey:—Evaporation takes place after it passes through the membrana secondaria. I claim that when deprived of the secretion of the tympanic cavity the membrana secondaria is drier than it should be on the tympanic side, the fluid of the labyrinth finds its way through the membrana secondaria, and follows the course of the fluid of the tympanic cavity, is in turn evaporated, thus diminishing the amount of labyrinthine fluid.

Dr. Sexton:—I would suggest that a man cannot prevent rupture of the drumhead, even if conscious, from loud sound of cannon, if in or near the blast of the discharge.

Dr. Richey:—Dr. Sexton's objection is well taken. I used the "explosion of cannon" to illustrate my meaning.

CHRONIC PURULENT INFLAMMATION OF THE TYMPANIC ATTIC (RECESSUS EPITYMPANICUS). (BASED ON THE OBSERVATION OF TEN CASES ADDITIONAL TO TEN CASES ALREADY REPORTED ELSEWHERE.)

By Charles H. Burnett, M. D., *Philadelphia, Pa.*

My first communications on this important aural disease were made in a "Treatise on the Ear," in 1877, and were further continued as a report of ten cases, with their treatment, in the American Journal of Otology in 1881. Again, in 1884, in a second edition of "A Treatise on the Ear," I published further considerations, especially upon the treatment of this disease.

Since the latter date I have collated the notes of ten more cases observed by me, and now lay them before this meeting.

This subject has been most ably written upon in this country since between 1874 and 1883, by Doctors J. Orne Green,[1] Clarence J. Blake,[2] Horace G. Miller,[3] and Albert H. Buck,[4] and later by Doctors Samuel Sexton,[5] and H. N. Spencer.[6] In Germany Politzer wrote of this disease as early as 1870.[7]

[1]Boston Medical and Surgical Journal, March, 1874.
[2]Transactions American Otological Society, 1874.
[3]Transactions American Otological Society, 1878.
[4]"Diagnosis and Treatment of Ear Diseases," New York, 1880.
[5]Transactions of American Otological Society, 1885.
[6]1887.
[7]Wiener med. Wochenschrift.

Subsequently in Germany, Morpurgo,[1] Hessler,[2] Düsterwald,[3] Paul Wirtz,[4] Kretschmann,[5] and Walb[6] have published articles on this subject and incidentally this disease has been mentioned by Von Troltsch, 1881. Bezold, 1883, and Schwartze, 1885. Aside from these sources I know of no other publications on this subject, in any other country. This I feel must be due to the fact that the form of the purulent disease has not been recognized; for that it exists elsewhere than in America and in Germany, we all feel very sure. I feel quite sure I have overlooked this particular lesion myself in some cases of chronic purulent otorrhœa which I have not been able to observe often. The cases which I now briefly present are numbered from XI. to XX., as they are really a second series of ten cases additional to those already presented elsewhere, as referred to, and make a total of twenty cases I have reported.

Case XI.—George G., age 42, presented himself for the removal of a plug of cerumen. After the auditory canal was cleared a small ulceration and perforation of the membrana flaccida was discovered. This was evidently due to erosion and pressure of the wax plug, and may be classed among those of traumatic origin. There was no pain and the ulceration and perforation healed rapidly upon removal of the cause of irritation, viz.: the pressure from the mass of cerumen.

Case XII.—Rev. D. K., age 65, presented a perforation in the right membrana flaccida, with copious and offensive

[1] Archiv für Ohrenheilkunde, 1883.

[2] Ibidem: 1884, Bd. 19 & 20.

[3] Thesis 1884 mentioned by Walb, Archiv für Ohrenheilkunde, Bd. 26, 1888.

[4] Thesis 1886 mentioned by Walb, Archiv für Ohrenheilkunde, Bd. 26, 1888.

[5] Archiv für Ohrenheilkunde, Bd. 25, 1887.

[6] Archiv für Ohrenheilkunde, Bd. 26, 1888.

purulent discharge. Under the use of instillations of a solution composed of sulphate of zinc gr. i, acid salicyl. gr. i, and water f.ʒ i, the discharge became less and the hearing improved greatly. In this case there was shown a tendency to the formation of a leathery scale of pus over the perforation, as is often shown in cases of this form of aural disease. The case had been very chronic but had never suffered pain from subacute attacks.

Case XIII.—Miss H. T., age 28, stated that a few months previous to the first consultation she had first observed a discharge from her left ear, without any preceding pain. On examination there was found a large polypus blocking the fundus of the canal, obscuring the membrana tympani. The polypus was snared off, and the pedicle treated by touching with chromic acid. When the latter was finally entirely removed, a large perforation, embracing the entire flaccid membrane, was discovered. The discharge was checked by the use of instillations of alcohol and water.

Case XIV.—Miss Margaret R. S., age 30. Had scarlatina at the age of three years, which was followed by otorrhœa, and some years later polypi were discovered and removed. Her hearing was very bad while a school girl. Symptoms of phthisis set in in early womanhood, and the patient had a hard struggle to reach thirty. Chronic otorrhœa continued in both ears, but chiefly in the right ear. Travel in Europe and California relieved the phthisical symptoms to a great extent, and the ears became less troublesome. The first examination revealed a perforation in the membrana flaccida of *each* ear. In the right ear there were granulations and considerable suppuration: in the left ear no granulations, and only a slight purulency. The hearing was best on the left side. Treatment had the effect of checking the discharge on the left side, and les-

sening it on the right side, in the course of one month. In the autumn of this same year, *i. e.*, four months later, there was a return of discharge from both membranæ flaccidæ, attended with eczema of both external auditory canals. The cachexia of this patient prevented entire cure. She died abroad this summer.

Case VI.—Mr. E. R. D., age 25. This case had been under treatment for chronic aural catarrh ten years previous to the beginning of his purulent disease. He stated that two years before this consultation, October 12, 1882, he had had an abcess in the left ear, the precise nature of which I could not determine. He now sought relief from an offensive discharge. There was found upon inspection a tense membrana tympani, immovable under the Siegle speculum, thick and white in appearance, and thrown into striæ. The lustre, however, was good. There was a perforation in the anterior part of the membrana flaccida, from which there came a thick, offensive scanty discharge which clung to the upper wall of the auditory canal. The patient complained of tinnitus and great hardness of hearing in this ear. Voice 6 inches. The right membrana tympani was also rigid and red at the periphery. Lustre good. No purulent disease nor any cicatrix in the membrana flaccida of the right side. H.=voice, 3 feet. By January 12, no discharge. In a month it returned, matter not flowing over the membrana vibrans. Under boric acid insufflations chiefly, the discharge ceased in a week and remained checked for one month. About this time there occurred an acute attack in the other ear, April 26, 1883, with pain, perforation in the membrana flaccida, and discharge, which was treated with boric acid powder. A slight discharge, however, continued into the summer, while not under observation. In August a polyp was found in the right ear protruding from the membrana flaccida. The

polyp was extracted and the running ear treated by insufflations of powdered boric acid. The discharge ceased under this treatment in a week. During this time the left ear was treated by instillations of a solution of sulphate of copper, 5 gr. to f.℥ i of water, under which the discharge ceased and the hearing became nearly normal.

Resuming the history of the left ear, it must be said that on April 6 the patient observed a bad odor coming from this ear. An examination revealed a large tough scale of epidermis and pus over the region of the membrana flaccida and the upper wall of the canal, near the membrana tympani. A very slight, thick discharge continued now until Nov. 8, when without any warning the discharge became very profuse, and the perforation was found to have become much larger. Pus welled from the perforation when the membrana vibrans was pressed. Into the attic cavity a solution of sulphate of copper was injected for some days and the discharge decreased. I then injected a solution of nitrate of silver. Some intense pain followed for a few moments and some dizziness. The weather was very inclement at this time and the patient was exposed. He took cold and had intense earache and was in bed for some weeks with otitis externa near the membrana tympani. After this the perforation was seen as a distinct hole in the wall of the canal near the membrana flaccida coalescing with the latter. Persistent, slight, purulent discharge continued, not checked by anything. Discharge, however, gradually diminished in the course of three weeks, and several days elapsed without any. Then the middle ear (attic) seemed to fill up and overflow through the membrana flaccida. Syringing by tympanic syringe removed scales of epithelium. Microscopic examination (January, 1884) of scales from tympanic cavity showed them to be cholesteatomatous. The ear was now under injection of Dobell's solution chiefly by the tympanic syringe. Very

little discharge now came from the attic. Still it did discharge and the neck of the malleus could be seen running across the perforation. Patient used alcohol at home until April, when he went to Europe for three months. Very little discharge during absence. Had used syringing and alcohol now and then, while abroad. Perforation unchanged in appearance. Lead injections now used for some weeks. Syringe nozzle can be inserted behind or before neck of malleus. No denuded bone can be felt. A probe ran in one-half inch. Copper solutions used a little while. Nearly a year elapses, during which ear is slightly running, but the use of instillations of alcohol at home controls the discharge.

February 1, 1886. Another acute process in the right ear. Membrana flaccida perforated posteriorly. Granulations apparently from attic and a boggy mass in anterior region of the membrana tympani. Touching this caused some dull pain in the frontal region. Finally I removed a large slough from the region of the membrana flaccida and revealed a large perforation. This was treated with insufflations of boric acid tinctured with hydrastin, and this soon healed.

Treatment of *left* ear begun again March 1, 1886, by means of injections of peroxide of hydrogen and 3% solution of carbolic acid, and continued frequently till July 31; then again in the fall. By September less discharge than there ever has been. The patient has used alcohol drops at home three times weekly. The membrana vibrans was dry and shining. Now and then patient says gushes of discharge seem to come. It may be supposed they are overflows and demand better drainage, which would also mean a better chance for treatment.

Case XVI.—Miss W., age 60, states that six months ago she noted tinnitus in the right ear. This ear had been

deaf for many years and a polypus is said to have been removed from it ten years previous. After the tinnitus set in the hearing function failed and some nausea and dizziness were felt, with a sense of pressure in the ear. Facial paralysis was present six or seven years ago, perhaps about the time the polypus was formed. When first examined by me, there was found a whitish pultaceous mass over the region of the membrana flaccida. Attempts at removing this with a probe caused nausea and vomiting. After soaking the rest of mass with a solution of bicarbonate of soda, glycerine, and water, the remnant was removed and an ulceration in the membrana flaccida with a polypus attached to it, was seen. The polypus was removed and the discharge checked by touching with nitrate of silver on cotton and then insufflations of boric acid powder.

Case XVII.—Dr. K., age 30. This was originally an aspergillus case. After the aspergillus was cured, I discovered a cicatrized perforation in the membrana flaccida. The patient was a subject of hypertrophic nasal catarrh, and gave the history of a former purulent discharge from the ear.

Case XVIII.—Mr. R. M. C., age 34, first consulted me in 1876, for chronic purulent otorrhœa on both sides. On the left side there was a large perforation extending over the membrana flaccida, and comprising also the margo tympanicus of the upper wall of the auditory canal. The discharge was checked in this side and has remained so to the present with a slight relapse in June, 1883.

Case XIX.—Mr. H. F. W., age 35, first consulted me Dec. 10, 1883, for chronic purulent otorrhœa, left side, with a perforation in the membrana vibrans. This was relieved

and the patient was not seen for nearly eighteen months, when he presented himself with a perforation and granulations in the membrana flaccida. The perforation in the membrana vibrans was still present and the mucous membrane discharging. Probably the perforation in the membrana flaccida was from maceration and erosion, as pus would hardly force its way through this, when a large perforation was already in the membrana vibrans. The granulations were touched with chromic acid and soon disappeared. The speedy cure is another evidence that the attic was not the seat of much, if any, disease.

Case XX.—July 14, 1888, Miss M., age 23, now under treatment. In childhood her tonsils were large; excision of these was followed by some earache and dullness of hearing at the time, but soon passed off and was forgotten, excepting that she thinks the right ear, the now diseased one, has never heard sharply. Six years ago, suddenly, without any pain or warning of any kind, the right ear felt stopped. Examination made by her physician then, revealed a polypus. Since then, off and on, there has been a slight offensive discharge; hardly enough to run from the ear. Numerous polypi have been removed, probably from the membrana flaccida perforation. I found the membrana vibrans intact, retracted, white, dry, and shiny, and a large perforation in the membrana flaccida, with neck of malleus visible and a very scanty discharge, not very offensive. I syringed the attic with peroxide of hydrogen and a 2% solution of carbolic acid, by means of the tympanic syringe. At the second syringing I brought to view a small polyp, evidently attached to the inner edge of the perforation and concealed in the attic. I removed it by slender forceps. After this the discharge was less. During the past summer the patient wiped out the fundus of the canal with absorbent cotton every second day and sometimes mopped

out the ear with 2½% carbolic acid solution. When seen September 1st there was found to be the very minimum of discharge: some days none. No pus apparently present, as peroxide of hydrogen fails to make a foam. A small granulation was found attached to the lower posterior edge of the perforation and removed by means of slender forceps. The attic was syringed with a 3% solution of carbolic acid, by means of the tympanic syringe.

Synopsis of the ten cases herewith presented:

Sex. { Men, 6. / Women, 4.

Position, { Anterior, 0. / Posterior, 2. / Central, 6. / Entire destruction of the flaccid membrane, 2.

Ear. { Right, 4. / Left, 4. / Both ears, 2.

Cause. { External, traumatic, 2. / Internal, tympanic, 8.

Polypi were found in seven cases—in both ears, in both the cases in which the perforation was in both ears.

Aspergillus was found in two cases, viz.: in Case XVII. and in one of the cicatrized cases. A simultaneous perforation in the membrana vibrans was found in only one case in the entire twenty, viz.: in case No. XIX. reported in this paper. It may be of interest to compare this synopsis with the synopsis of the ten cases previously reported elsewhere:

Sex, { Men, 7. / Women, 3.

Position of perforation, { Anterior, 2. / Posterior, 3. / Central, 3. / Entire destruction of the membrana flaccida, 2.

Ear. { Right, 4 / Left, 3. / Unrecorded, 1. / Both ears, 2.

Cause, { External, traumatic, 3. / Internal, tympanic, 7.

Polypi were found in four instances in this series (first ten) and the perforation was in both ears in two instances. In this series one of the cases recorded in the American

Journal of Otology as in the right ear, should have been placed under "both ears."

In addition to this synopsis we learn from the notes of the cases, that in many instances this disease of the ear comes on without pain, and may be said to be chronic from the outset. Children are not liable to this form of chronic ear disease (one in twenty) though some observers state that acute inflammation of the attic, with perforation of the membrana flaccida, is frequent in children. The chronic form occurs in 1% of all cases, according to my experience, about the same as Bezold's ($1\frac{1}{4}\%$). The hearing is greatly impaired in the chronic form of this disease, though it often improves temporarily after the attic is washed out. The discharge, as a rule, is scanty, thick, and very offensive. Being scanty it rarely flows over the membrana vibrans, and the observer is often surprised to find the latter dry and shining in an ear which is the seat of a discharge. The latter usually clings to the upper wall of the auditory canal, forming gradually into a tough pellicle, darkened by exposure to the air. This may extend along the upper wall to the external meatus, underneath it being a thin layer of fluid pus. Upon the removal of this pellicle the perforation in the membrana flaccida can be seen. A scanty discharge of this kind may go on for years without being copious and fluid enough to flow down over the membrana vibrans, which, as stated, may misguide the inexperienced observer.

The absence of the "perforation whistle" in these cases has often been noted by writers on this subject. I think this is due to the fact that the perforation in the membrana flaccida is not often anterior and therefore not in communication with that part of the attic nearest the tympanic mouth of the Eustachian tube.

When the perforation is anterior, as in a case of a boy given in my first series of ten cases, the perforation whistle

is very marked. In the case alluded to the flaccid membrane of each ear was perforated anteriorly, and in both ears the "perforation whistle" was easily produced. As I have never observed it where the perforation was not anterior, I have concluded that the ossicles and the swollen and secreting mucous membrane about them, interfere with the passage of air through a perforation beyond or behind them, and hence the perforation whistle is not heard in posterior or central perforations.[1] That the perforation whistle was not heard in the cases I have tabulated as entire destruction of the membrana flaccida, must have been due to the fact that the Eustachian entrance into the tympanic cavity was in some way obstructed.

Treatment.—The chronic form of purulent inflammation in the attic of the tympanum is difficult to cure, especially when the attic has been the starting point of the disease, while those cases originating from without the drum cavity (the traumatic) are easily managed.

The cases of tympanic origin most easily cured or benefited are those in which the perforation in the membrana flaccida is large, and in which of course medication and drainage are most complete. Of the various forms of treatment, the most successful are cleansing and antiseptic, as for example that by means of peroxide of hydrogen and carbolic acid.

The only way of directly washing out the attic and of medicating it, is by means of the tympanic syringe of Dr. C. J. Blake.

The best applications have just been named, but alcohol and aqueous solutions of zinc, bicarbonate of soda, chloride of sodium, lead, copper, &c., may be applied. Powdered applications are impotent in these cases, as the perforation

[1] Kretschmann (loc. cit.) gives two cases, both of them boys under 13 years of age, with anterior perforations, in whom the "perforation whistle" was observed.

is too small to permit their entrance into the diseased cavity. They might even do harm by blocking the small outlet for the pus, and thus aid in forming a nidus for systemic purulent infection.

All forms of escharotic or cauterant treatment, like that by strong solutions of nitrate of silver, are not borne by the attic when in a condition of chronic purulency, chiefly, I think, because the swelling of the edges of the perforation induced by such treatment closes it, drainage is interrupted, the pus undergoes decomposition, and a dangerous inflammation in the region of the tegmen tympani may be set up, as has once happened in the experience of the writer.

So important is drainage in these cases that it has been suggested to obtain it by surgical interference, either by enlarging the hole in the membrana flaccida by continuing it up into the bone in the segment of Rivinus, *i. e.*, by cutting into the edge of the margo tympanicus of the inner edge of the upper wall of the external auditory canal,[1] or by excision of the membrana tympani and the malleus and incus.[2] One or both of these bones may be found necrotic. In fact, denuded bone can often be felt in these cases, by means of a slender probe passed through the perforation.

This dead bone can be scraped if the perforation is enlarged by excision of the ossicles, or by removal of some of the margo tympanicus. Thorough cleansing of the attic is demanded in these cases if a cure is to be accomplished, and this washing out must be kept up after the attic is exposed by either the enlarging of the perforation in the flaccid membrane, or removal of the malleus and incus.

A cure, more or less speedy, follows in such cases, according to Schwartze, Sexton, and others (loc. cit.).

[1] Kretschmann. loc. cit.

[2] Schwartze, Lehrbuch, p. 287, 1885, Sexton, loc. cit. 1885. Düsterwald, 1884, according to Walb, loc. cit.

Although I have not yet performed such an operation for the cure of this disease, I feel sure that hereafter I can obtain a radical cure most surely by this means — and perhaps not at all by any other — and am prepared to thus inform my patients, as this form of purulency of the middle ear, from its proximity to the brain, is the most threatening to life and demands a careful consideration of every means for its radical cure.

EXCISION OF THE DRUMHEAD AND OSSICLES FOR THE CURE OF CHRONIC PURULENT INFLAMMATION OF THE ATTIC OF THE TYMPANUM.

By Samuel Sexton, M. D., *New York, N. Y.*

In the greater number of cases of persistent otorrhœa coming under the surgeon's observation, the tympanic attic is the principal seat of disease and naturally cannot be reached by the many domestic and trade remedies which are so often employed with great freedom before the case is seen. And in the usual medical management of such cases with syringe, cauteries, and astringents, either wet or dry according to vogue, it is surprising how much ineffectual work may be done in a conventional way in so small a receptacle for medicaments as the drum of the ear. Indeed, in scarcely any other branch of surgery has progress been so slow, or are obsolete practices so persistently maintained, as in the treatment of the ear.

Whilst the writer was casting about with the desire to obtain a more secure footing in the treatment of seemingly irremediable cases of chronic purulent inflammation of the middle ear which had exhausted his resources and patience, it occurred to him to ascertain what changes had taken place in other departments of surgery since his early experience therein, and he was therefore led to attend the surgical clinics of some of his friends in our metropolitan hospitals, where so much admirable work is now being done. He was particularly interested in several operations upon the joints which he was fortunate enough to witness. The results of these were a revelation as compared with

that obtained but little over a decade ago. Thus cases of chronic synovitis of the knee joint, where effusion had been followed by caries of the osseous tissues, with infiltration, suppuration, and the formation of sinuses, which had been radically treated by removal with the knife of dead structures and the establishment of drainage were, when again seen a few weeks afterwards, found to have been cured. The writer was on reflection very much struck with the analogy the condition of these patients offered to what exists in chronic suppurative disease of the attic of the drum, where we may have chronic inflammation of its muco-periosteal lining with caries of its bony walls and of the ossicles, together with synovitis of the articular surfaces of the latter. And as in the knee joint in chronic inflammation, such imperfect drainage as exists takes place through sinuous outlets.

In chronic synovitis of the knee joint, the modern surgeon no longer poultices and blisters, or injects the parts with iodine and various astringents, etc., for an indefinite period of time, as is so often yet done in inflammation of the middle ear tract, but promptly applies the knife for the removal of diseased structures and establishes drainage.

The aural cases in which excision is indicated, constitute a much larger class than is embraced in the comparatively few longstanding examples where the more prominent symptom is the occasional occurrence of slight discharge through a sinus in the membrana flaccida. A radical cure by the knife seems called for, as in diseases of the joints, in run-down and cachectic subjects, especially those who have been long neglected or badly treated, and where the conductive mechanism is irreparably damaged and the condition of the attic offers great obstruction to drainage. These cases constitute a large class, as is well known. The otologist often meets with cases of this

kind that have existed for a great many years, coming either on account of the deformity of the transmitting mechanism and consequent deafness existing long after all discharge has ceased, or with occasional discharge and comparatively slight deafness. The efforts of nature, and the results of ordinary treatment alike, are very often ineffectual, and a case of infantile purulency leaves the transmitting mechanism of the ear irreparably damaged. The suppuration, so common in these cases, is not only a drain upon the system, but it may also constitute a source of septic infection.

In chronic suppuration of the tympanic attic, it is often found that the greater portion of the drumhead comprising the membrana vibrans is largely, or wholly, absent: the membrana flaccida infiltrated, thickened and often inverted, whilst the cavity itself contains more or less granulation tissue, thickened folds of muco-serous membrane and useless portions of the transmitting mechanism. The muco-purulent secretions now find a precarious outlet through one or more sinuses through the membrana flaccida, or downwards into the atrium between the descending limbs of the hammer and incus. When this drainage is obstructed, painful accumulations take place, and owing to the near proximity of the drum to the brain, danger to life is much greater than in similar conditions elsewhere. Even where the attic disease ceases to be active and is seemingly cured by an expectant course or follows treatment, the trouble is liable to break forth again and again along with invasions of the middle ear tract during the existence of head colds.

Were the remains of the defective mechanism and other diseased tissues of the tympanum removed in these cases at an early day, purulent discharge with its attendant exacerbations could be cured, and hearing usually much improved.

From the writer's experience thus far, now extending over a period of nearly three years, he is convinced that we have much to hope from the treatment by excision, and while we cannot under all circumstances treat the ear as antiseptically as may be done in the joints, we can generally insure free drainage, which constitutes the main feature of treatment in chronic suppurative diseases. The operation itself has been so often described that the time of the Society need not be taken up with its details on this occasion.

DISCUSSION.

Dr. Pomeroy :—"The useless conducting mechanism of the ear": would the doctor explain what he means by that?

Dr. Sexton :—The "useless conducting mechanism of the ear" may consist, in part at least, of structures irremediably impaired by suppurative inflammation. Thus (1) the remains of the membrana vibrans, useless for sound transmission, may be found thickened, with one or more perforations, and adherent in places to the tympanic wall. (2) The membrana flaccida, when the entire membrana tympani is absent, is often much thickened and perforated, and its margin inverted. (3) The various folds of the membrane lining the attic of the drum, together with bands of new formation, forming pockets, hold the diseased and more or less displaced hammer and anvil in their embrace and thus obstruct drainage. In certain cases the drum contains a greater or less quantity of granulation tissue. These diseased structures are incapable of transmitting sound vibrations in the normal way and are, moreover, a hindrance to the passage of sound to the fenestra of the tympano-labyrinthine wall.

Dr. Pomeroy :—I felt surprised that Dr. Burnett had so

little to say about granulation tissue in these cases. Dr. Sexton seems to have sufficiently alluded to it. It seems to me that the destruction of anything like granulation tissue in this region should be accomplished by cauterization or otherwise,—that being in the direction of cure as much as anything. What has been said with regard to perfection of drainage I would endorse in the most emphatic manner. One point that puzzles me a little is the infrequency with which you can get the perforation whistle in these cases. I should feel entirely clear as to enlarging the opening, as Dr. Burnett has mentioned, though I might not feel like going as far as Dr. Sexton has in removing bones. I should not, however, hesitate if there was anything in the way of perfect drainage, whether it was the ossicula, or drum-membrane, or granulation tissue,—*anything* that obstructed the free drainage of the deeper parts might be removed.

Dr. Richey :—This subject of suppuration in the tympanic attic interests us all. About eight years ago I had under my care for the first time a child of six years of age, who had general inflammation of the tympanic cavity, with discharge through a perforation situated below the plane and in front of the umbo. Treating this by injections through the Eustachian catheter, I succeeded in controlling the suppuration and healing the membrane at that point. In the beginning there were symptoms indicating deeper-seated trouble, inability to control the sphincter of the bladder at night. She was very nervous and even though the healing of the membrane took place, the discharge continued. Forcing air into the middle ear by means of the catheter produced no whistling. The discharge was from the attic and yet I could find no opening. I had tried nearly all the suggested methods of treatment when I was fortunate enough to receive a reprint of a paper by Dr. Spencer, of St. Louis, commending the use of a strong

solution of nitrate of silver, followed by iodoform packing, as sometimes entirely controlling these cases. I began to treat this condition in this way, though it seemed a very blind proceeding. I used a twenty per cent. solution of silver over the region of the abscess, applied with a probang of cotton, following this with a tampon of cotton containing iodoform, allowing it to remain. I saw the case about three times a week for about two months, when there was entire sessation of discharge. The child is still well, so far as I know, and has been for a year.

I thought of cutting down upon this abscess, but the child was nervous from the constant discharge and the irritation arising from the location of the abscess and I hesitated to do so unless compelled. Such cases are very difficult to manage.

Following a general inflammation this was a cystic abscess formed in the attic, after which entire separation occurred of the attic from the cavity. Air could not be forced through the abscess. Unless one cuts down upon such an abscess and drains it, the only thing to do is to wash it out; not to allow the pus to be dammed up. Peroxide of hydrogen followed by astringent lotions had been used with no result (permanent?) until I adopted the method described.

Dr. Pomeroy:—Does Dr. Burnett receive any benefit from exhausting the air from the part as a means of determining whether there is any concealed pus anywhere or fluid, inflammatory product? It occurred to me that that would be a good method of handling these cases, and as he first suggested that idea, so far as I know, I would like to ask whether he has used it in his cases or not?

Dr. Burnett:—I have not relied upon it in these chronic cases. Without referring to my notes I could not tell whether I have tried it or not. It does not at this moment recur to me that I did use the Siegle's aspirator. I am inclined to think I did not.

Dr. Theobald :—My experience in these cases of suppurative inflammation in the attic is that the discharge is not great. What discharge there is usually finds its way into the auditory canal and does not leak down into the tympanic cavity proper. It does not seem to me, therefore, that the excision of the tympanic membrane is necessary for drainage. If the fluid found its way into the drum cavity and was retained there, the removal of the whole tympanic membrane might be indicated, but not otherwise.

Dr. Tilley :—I am interested especially in the removal of the ossicles, as I have observed a certain class of cases where it would seem to be very beneficial. I rise to ask for some information relative to the possible difficulties that may arise. I refer particularly to the chorda tympani, which is especially prominent in my mind on account of a case in my hands about three weeks before I came away. I had the misfortune of cutting the chorda in making an incision into the membrane itself. I took, as I thought, especial precautions not to cut too high. I went high enough to sever the nerve. My patient experienced a peculiar sensation in the right side of the tongue. On examination I found that the sensation of taste was lost on that side of the tongue. If that can occur in the simple incision of the membrane it seems to me it must sometimes occur in more extensive operations,—in the removal of the ossicles; and I would like to know if the experience of others has been in any way corresponding to mine.

Dr. Sexton :—In reply to the gentleman's inquiry I would say that at first the chorda tympani in my own operations was divided quite frequently and with the result of perverted sensation of taste on the side on which the operation was made. I found, however, that in all cases, without any exception whatever, the function was restored in a very short time. The disturbance varies.

Some persons where I divided it, did not complain of it at all. Some obtuse persons, I think, are not so observant in matters of that kind. In some, very great stress was made of the fact that the sense of taste was altered, but afterwards I adopted the plan where I removed the incus and the malleus both, to take out the incus first and then detaching the malleus with a great deal of care; in that way the chorda tympani is not so liable to be disturbed. In operations upon the ear for chronic catarrh I have had but slight, if any, disturbance of taste: and I think with care you can avoid injury to the chorda tympani nerve. The danger from wounding the nerve, if any there be, lies in the shock probably transmitted in the other direction, not towards the tongue. I don't think there is any risk in the operation. In a large number of cases of chronic purulent inflammation of the attic I think the chorda tympani nerve has been destroyed already. The sense of taste is a compound one, perhaps, and does not depend altogether upon the chorda tympani nerve: when this is severed, taste apparently soon resumes its normal condition again, irrespective of the chorda tympani.

Dr. F. M. Wilson:—In view of the prominence which antisepsis has assumed in the treatment of other suppurating cavities I am surprised that it has not been more extensively used in treating this cavity. Difficulty of access and dangerous proximity to the brain are, of course, two facts in the way of its successful application. I have, however, received sufficient encouragement from its use to make me wish to continue it. I recall one case in particular which illustrates in a striking way the value of antisepsis. The attic was undoubtedly the part involved. The external opening was at the junction of the membrana tympani with the upper wall of the external canal. There had been constant profuse discharge for fifteen or twenty years. She had been very persistent in seeking relief and quite a

number of the gentlemen present have had her under observation. I treated her for a number of weeks with cleanliness, astringent solutions, boric acid powder, and also bichloride solution ($\frac{1}{1000}$) with some lessening of the discharge as the only result. Finally, and partly on the patient's suggestion, she kept her ear full of bichloride solution ($\frac{1}{1000}$) most of the time for a week, giving her whole attention to it. At the end of the week the discharge had entirely stopped. She continued the bichloride solutions several times a day, but notwithstanding this the discharge reappeared in a month. After two days of constant use, it again ceased. That was about eight or nine months ago. It has reappeared twice since, but each time she controlled it without consulting me. Whether the tendency to relapse will ever disappear, I am, of course, unable to say.

Dr. Burnett:—In reply to Dr. Theobald I would say that quite a number of these questions have been answered in the notes I did not read. Dr. Theobald suggested that the pus not getting behind the membrane proper as a rule, excision was not necessary, perhaps as a means of drainage. I too used to think that pus did not get behind the membrana vibrans; but I found by pressing on the membrane I could make pus come out through the perforation in the membrana flaccida in many cases, so that although pus does not accumulate below the folds in quantities large enough to distend it, it does get down there below the opening. The membrana vibrans is as a rule imperforate, so that matter gets down behind it and is held there.

As a matter of drainage, so far as drainage of the attic is concerned, the membrana vibrans perhaps need not be removed, but the malleus and incus should be and the removal of the membrana vibrans is simply incidental to that measure. The excision of the membrana tympani simply takes away one of the supports of the malleus.

As to antiseptics: I have never used bichloride of mercury much, because it generally made the patient feel ill. I have not been able to effect in any way what I call a cure in any case of chronic disease of the attic, in which the membrana flaccida was perforated. I have procured periods of relief for many months. I have watched some of my cases four years at intervals, and the very best results were only immunity from the discharge for a year at the most. Sometimes the patients would go to Europe and hardly know the discharge was forming in their ear, being able to cleanse it with a little disinfectant on cotton. Still, when they come back the disease was simply in abeyance: and as I have never been able to effect a cure I am forced now to resort to an advanced measure, if I may say so, and that is excision of the diseased ossicles. This has been done with success, the entire diseased region cicatrising over, which is the only cure we can effect. Excision has been practised for these cases by some of the Germans. They are called in these instances by some of the German authors, "Perforations in the upper pole of the membrana tympani." I feel sure that if we wish to thoroughly drain the cavity and disinfect it, there is only one way to treat it, viz., as we treat similar conditions of bone in other parts of the body.

As far as the chorda tympani is concerned: I have removed the membrana tympani and the ossicles in two cases of so-called chronic deafness and could see no effect whatever upon the chorda tympani. I think I cut it but there was no evidence of it so far as the patients were concerned.

DR. SEXTON:—I can add very little to what has been said. I am more and more impressed with the importance of clearing out the tympanum in these old cases, which have been styled probably incurable. The disease would disappear for a time; but the patient takes cold in the head or

gets run down and they appear again and then stop either with or without treatment. I have found where the membrana flaccida and the ossicles have been excised, that the parts, on healing up, present a clean smooth appearance. The tympanum can be seen in every point and as soon as that becomes dry, as it usually does, often quickly, the patient no longer has any purulency.

Another thing: as to the improvement in hearing, a large proportion of these patients improve in hearing and it seems to be from the fact that a larger cavity is opened up for the condensation of sound. The sound waves seem to condense as in a trumpet and the impact on the base of the stapes or round window seems to be more effective indeed: the improvement in hearing is very striking sometimes. It is as important to the patients as the cure of the purulency.

NASAL DIFFICULTIES IN EAR DISEASES.

By J. Oscroft Tansley, M. D., *New York, N. Y.*

It is with considerable diffidence that I rise to address you upon the subject of Nasal Difficulties in Ear Diseases, for I see so many before me who are better able to speak upon this subject than I; but I desire to raise my humble voice in this direction and to state my experience. I know you will be considerate, and I hope you will also be critical in your discussions, for by these discussions we shall better understand the points I may advance, and otology will be the more benefited. Of course my paper cannot be considered as a treatise upon Nasal Difficulties, for to exhaust the subject would take more of your time than I dare ask for. I desire only to speak of them simply as an otologist and as to the relation of cause and effect which I have found to exist between them and ear diseases.

Nasal difficulties have a most profound influence upon all the acute and chronic diseases of the ear and for this reason merit and demand our study, care, and attention to cure those diseases which we find them complicating and to avoid such diseases of which we know they are a cause.

Early in my study and practice of otology, I recognized this fact and began to perfect myself (so far as my ability and opportunity would permit) in the knowledge and treatment of these diseases of the nasal and naso-pharyngeal passages, and this knowledge, limited though it may have been, has many times permitted me to relieve and cure cases which I could not otherwise have benefited.

I cannot allude to the ear diseases caused, except to

mention them by name, else my paper will be too long for the time at my disposal; and the number of cases which are upon my books, and which would illustrate my remarks, will have to be omitted for the same reason, interesting as they would undoubtedly be to you, and doubly interesting to me to relate.

The points which we will consider will be:—

1. Anything which wholly or partially occludes one or both nostrils.
   - *a.* Deviated septa.
   - *b.* Œdematous tissue.
   - *c.* Hypertrophied tissue, as exostoses, hyperostoses, etc.
   - *d.* Nasal polypi.
2. Hypertrophied tissue peculiarly placed, but not necessarily occluding.
3. Hypertrophied tissue exciting as well as mechanically pressing upon the Eustachian tube.
4. Bands of tissue seemingly cicatricial, stretching from the posterior wall of the pharynx to the Eustachian tube.
5. Atrophic or cicatricial rhinitis with unusually patulous Eustachian tubes.
6. Simple naso-pharyngeal catarrh.
   - *a.* Simple mucous catarrh.
   - *b.* Muco-purulent or hyperplastic catarrh.
   - *c.* Fibrous catarrh.
   - *d.* Ozenic catarrh with inspissated crusts.

ANYTHING WHICH WHOLLY OR PARTIALLLY OCCLUDES ONE OR BOTH NOSTRILS.

This condition, about which I shall speak later and more particularly, is a great cause of acute, subacute, and chronic catarrhal and suppurative diseases of the middle ear, and these results are brought about chiefly by a mechanical means.

It is the rule rather than the exception, when one nostril is occluded to find the ear upon the same or corresponding side affected in one of the above mentioned ways, and whenever we find an occluded nostril we should immediately examine the corresponding ear, and vice versa.

We know that the mere habit of lying upon one side of the body more than another predisposes the corresponding ear to suppurative or non-suppurative catarrhal affections brought about seemingly by the natural or unnatural secretions of the parts falling by gravity into the tympanum and also by lying upon and about the opening of the Eustachian tube during sleep. When we have an occluded nostril this condition obtains all the time, when erect as well as in a supine position, for the cleansing effect of the air forcibly expelled, and the desiccating effect of the air inhaled and exhaled as in nasal breathing cannot be secured. If we examine these cases rhinoscopically, the posterior nasal opening will be found filled or surrounded by a stringy yellow or greenish mucus which will have to be wiped away with a swab before the Eustachian opening can be examined, and which in turn will be found reddened, boggy, and swollen, and not unlike the appearance of the conjunctiva in acute catarrhal conjunctivitis.

This condition present at the Eustachian opening is continuously that or similar to that of a subacute naso-pharyngitis; it is then but a question of time, more or less, for a subacute catarrh to become established in the Eustachian tube or tympanum, bringing about a failure in absorption or an excessive secretion and causing an hydrotympanitis or otitis serosa, and which some slight exposure or irritating, coryza, sea bath, or cold draft, increases to an otitis suppurativa with all its attendant dangers.

When a patient has a partially or wholly occluded nostril he is continually making an effort to cleanse his naso-pharyngeal and nasal cavities of the mucus which normally should pass out easily or be desiccated by the passage inward and outward of the air. This repeated hawking and blowing of the nostrils keeps up a continual irritation and veinous congestion of the ears; and oftentimes an effect similar to Valsalviation is produced a number of times

a day: and by reason of this continual veinous congestion, we have a chronic catarrhal process established in the tympanum, and possibly also proliferous changes in the internal ear, for I have noticed a failure in the receptive as well as in the conductive power of these ears; but I am unable to say if this labyrinthine process was secondary to the tympanic catarrh or to the veinous congestion of the parts.

DEVIATED SEPTA.

This condition is often present and should always be corrected as early as possible to prevent the possible ear complications, and as the first step towards treating an ear disease or deafness which will almost invariably be found accompanying if the nasal condition has existed for any length of time; and I hold that every aurist should be able and competent to operate and treat these cases as they merit.

I cannot take the time to go deeply into the consideration of these cases and mention the various operations devised for their cure, but will simply state what I have done for, and how I have and am treating these cases.

Sometimes we have simply a deviated septum, with no great hypertrophy of tissue or cartilage; when this is the condition I have found it only necessary to break up the septum, replace and retain it in position by means of tampon, tube, tent, or pin, and I have generally been successful in such cases in procuring a passage through the nostril for breathing, not heeding the cosmetic effects.

Usually these cases will have upon the convex side some hypertrophied tissue or cartilage or bony exostoses or hyperostosis. I have had recently under my care a case in which the nose was almost a monstrosity, and was twisted greatly to one side and yearly becoming worse by reason of this hypertrophying cartilage and hyperostosis on the convex side. He consulted me because of an acute otitis

which was caused by an effort to clear his nostril. In these cases it will be impossible to replace the redundant tissue, for the nose will generally be found to have sunken down somewhat and it will be necessary always to remove some or all of this hypertrophied tissue. There are various ways of doing this, but I have adopted the plan of removing the convexity as entirely as possible by means of a saw, and if possible without passing into the fellow nostril, but if this is necessary or unavoidable, I close the opening made, with a silver suture at the time of operating or later; then tent the nostril to retain its shape and patulency, and where necessary I operate again upon the septum, as I would in the more simple cases where the hypertrophied cartilage or bone is not present.

I have adopted this mode of operation because many will not permit me to etherize and do the more difficult operation, but will submit to the lesser operation under cocaine, and the results here are sometimes sufficient so far as the ears are concerned.

In operations upon the septum under ether, I always tampon the posterior nares, passing my cord through the open nostril and using a sufficiently large tampon to fill the whole naso-pharyngeal space. My reason for so doing is to prevent the blood, mucus, and water used to stay the hemorrhage from passing into the larynx or Eustachian tube.

The tympanum of these cases is generally in an excited condition and but little is necessary to start up an acute process and it is not only well, but imperative for us to anticipate this fact, and avoid if possible such dangers, not only to hearing, but to life.

It has been my lot to see one or two cases upon which the operation for deviated septum was performed, and where the precaution of tamponing had not been resorted to, and the result was a suppuration of one and both ears, and as

the operations were performed to benefit a catarrhal otitis media, the result was a much more profound and serious deafness established in a month, than would have obtained in several years of ordinary catarrhal or non-suppurative process.

I will not do the operation or permit it done upon one of my patients, without tamponing the posterior nares, and I urge my hearers to take the same stand.

After the operation I have the patient's nose sprayed several times a day with an exosmotic and disinfectant solution so as to avoid an accumulation of secretions in the naso-pharynx.

ŒDEMATOUS TISSUE.

This condition is very commonly found to be present both as an acute and chronic process, and the degree varies in varying cases. Some are so markedly œdematous on the inferior turbinated bones that hardly a particle of air can be made to pass through the nostril without a powerful exhalation. The diagnosis can be easily made by pressing a probe against the mucous membrane and the difference between an œdema and hypertrophy can be seen at once: or the parts may be sprayed with a solution of cocaine, and if œdematous it will almost entirely disappear, whereas if it is hypertrophy, very little change will result. I have tried all kinds of escarotics and astringents, but without much success, and I now bring about contraction by removing the œdematous tissue with snare, knife, or galvano-cautery; this latter I never use excepting upon the anterior portions of the nasal cavity, because of the liability to produce suppurative otitis if used upon the posterior portions of the nose and naso-pharynx.

HYPERTROPHIED TISSUE.

This causes nasal occlusion by being located upon the inferior turbinated bone and is often accompanied by hyperostoses.

I have operated upon a number of such cases where the tissues and bone were so increased in size and density and pressed down so closely upon the floor of the nares as not to permit the passage of the smallest probe or wire.

In such cases, and in fact many of the less serious ones, nothing short of removing part of the inferior turbinated bone will benefit the patient.

I have never used the surgical or electric drill, but have always succeeded with the saw and snare, and it seems to me in less time and with less annoyance than I could in any other way.

The simple hypertrophied tissue I remove with snare or cautery.

It may be interesting to give an explanation of a case upon which I operated a day or two ago.

The inferior turbinated bone was largely hypertrophied and curled upon itself at its lower extremity, as is often the case; and pressed so closely upon the floor of the nares that its lower edge was buried in the mucous membrane, and even after using cocaine some time, I was unable to pass the snare wire along the floor of the nares in order to embrace the bone longitudinally. The passage between the bone and vomer was only wide enough to admit the smallest probe and the space between the bone and ala was even smaller.

I passed a delicate saw between the inferior turbinated bone and vomer or septum, and with a few delicate strokes divided the turbinated bone longitudinally; then preferring to finish the operation as I usually do with the snare, I caused it to embrace the bone in the following manner:

I passed a flexible rubber catheter between the turbinated bone and the ala of the nose into the throat and out of the mouth; and with it drew the wire in the same way; then passing the rubber catheter between the turbinated bone and the septum and again out at the mouth, I fas-

tened the end of the wire which came out of the mouth to the rubber catheter and drew it back into the pharynx and out of the nose between the inferior turbinated bone and vomer: thus, it will be perceived, I caused the snare wire to embrace the inferior turbinated bone longitudinally: then laying the wire along the cut made by the saw, it was attached in the usual manner to the Jarvis apparatus and drawn home, cutting off the lower edge of the inferior turbinated bone as I had desired. The whole operation consumed not more than half an hour and was done entirely and only with cocaine.

NASAL POLYPI.

Strangely as it may appear to some, in my practice polypi of the nose have had seemingly but little effect upon the ears, excepting where they have obtained a density and size sufficient to occlude the nostril.

The reason for this seems to be that they are located high up in the nasal cavity and usually leave a passage below for the free exit of the secretions, and as everyone is alive to the importance of their removal, they are not permitted to attain the size necessary to occlude. In all of the thousands of cases seen by me at office and clinic I cannot remember and I have no notes of but one case in which nasal polypi apparently affected the ears; of course I mean simply nasal polypi unaccompanied by any of the other difficulties of which I have spoken or shall speak. The case to which I refer had been treated by her physician for seven years for hay fever and who sent her to me because her "hay fever was affecting her ears."

I removed four polypi as large as my thumb, which hung from the superior and middle turbinated bones down into the nose and naso-pharynx and were lying upon and against the left Eustachian tube. The left ear was affected with otitis serosa which was, as well as the hay fever, cured by the operation.

I saw the patient a few days ago and I ascertained that neither the otitis serosa, the hay fever, or the polypi have returned again after the lapse of three years.

HYPERTROPHIED TISSUE PECULIARLY PLACED, BUT NOT NECESSARILY OCCLUDING THE NOSE.

A very large per cent. of the cases seen by me and treated for chronic catarrhal otitis have had more or less hypertrophied tissue upon the posterior aspect of the inferior turbinated bone, and I deem it one of the most prolific causes of this disease. It can only be observed with the rhinoscopic mirror, and is seen to lie close down upon the floor of the nares just anterior to and upon a level with the opening of the Eustachian tube and looks not unlike a mucous wart. It does not occlude the nostril at any time, I think, excepting when it has been permitted to grow and become naso-pharyngeal polypus. From my observation of ear dieases it seems that where we have a free passage along the floor of the nares, even if the upper parts are affected, we have but little annoyance comparatively to the ears. This is, I imagine, because the nose can then be kept clear of discharge with but little effort: whereas, if the opposite obtains and the floor of the nares is obstructed, then the ears are always more or less affected. This hypertrophied or polypoid tissue which we are now considering, because of its position as above explained, stops the free passage along the floor of the nasal cavity, and although the nose seems clear, the air has to pass up and over this hypertrophy, leaving the secretions on a level with it undisturbed; thus it is always bathed in or covered with mucus or muco-pus and when examined posteriorly the secretions can be seen lying upon and about it and stretching backwards to the Eustachian tube, which is, as I said above, just posterior to and on a level with this hypertrophy, and

just in the position to catch the matter which is discharged from it with every forcible inhalation, and also when the patient lies upon the back or side.

This tonsil hypertrophy upon the posterior aspect of the nasopharynx should always be looked for and removed if present, even in small quantities.

It seems upon examination comparatively easy to remove with the larynx snare but it is often difficult. I always operate through the nose and watch my manipulations of the snare in one hand by means of the rhinoscopic mirror held in the other, while my nurse or assistant holds the patient's head and shoulder the while.

There is often very severe hemorrhage after the operation, and I have several times had to tamponade the posterior nares, this being the only way in which pressure can be exerted upon the bleeding spot. Chlorine seems to increase the liability to hemorrhage.

HYPERTROPHIED TONSIL EXCITING AS WELL AS MECHANICALLY PREVENTING OPEN THE EUSTACHIAN TUBES.

The pharyngeal tonsil, so called, is often more or less hypertrophied and I have met it not only complicating but causing many cases of acute, subacute, and chronic catarrhal and suppurative otitis. I have found it in all degrees of enlargement from simply pressing upon and exciting the Eustachian tubes to entirely and perfectly occluding the naso-pharyngeal space, so that not a particle of air could be made to pass above the velum. This hypertrophy lies exactly between the Eustachian tubes and upon the posterior wall of the pharynx; it never extends below the velum and seems to increase only laterally forward and upward on the under surface of the basilar process. When largely increased it lies in folds like cerebral convolutions which are directed mainly upward and downward; and in

one case upon which I operated recently there were five main folds as large as my thumb and which pressed tightly against the posterior nasal openings, making it impossible for the patient to breathe or to forcibly pass air through the nostrils, and it was impossible for me to see, with the rhinoscopic mirror, the posterior nasal openings or the Eustachian tubes. When this patient first consulted me he could not sleep longer than two hours because his mouth would become so dry from mouth breathing and the impossibility of nasal breathing. His hearing distance for the watch was only two inches in each ear, and the tympanic cavities were each full of sero-mucus. I was very much afraid of acute suppurative otitis and did not puncture the drums, but operated upon the naso-pharynx as rapidly as possible. After four weeks' treatment he had perfect nasal breathing, the drumheads were clear and healthy and his hearing distance was for the watch eight and ten feet. Of course, in all exaggerated cases the Eustachian tubes are hermetically closed and the tympani are wholly or partially full of sero-mucus if they are not already suppurating.

The ear diseases in these cases are more or less serious according to the development of the hypertrophy, and I have found it causing chronic catarrhal otitis, hydro-tympanum, otitis serosa, acute and chronic suppurative otitis, all of which I have been able to benefit or cure by the removal of this tissue, and the necessary local treatment, many of which I had unsuccessfully tried to cure without operating upon the naso-pharynx.

This hypertrophy and the hypertrophy of the vault of the pharynx, which latter seems really to be a part of the former process, is a very important element of danger in diseases of the ear, and should always be looked for and removed if present. It acts mechanically as well as an excitant to the mucous membrane of the tube and tympanum,

interfering with and affecting the equilibrium of secretion and absorption and probably also affecting the ears as a peripheral irritant, but to what extent I cannot now state.

In the operations for the removal of this hypertrophy I sometimes use cutting forceps through the mouth, but generally I use the Jarvis snare through the nose, but never through the mouth. I also *never* use the galvano-cautery because of the danger of suppurative otitis.

These cases always have a certain amount of tympanic excitation which will take but little irritation to be increased to a suppurative process and they should for this reason be handled with considerable care. The bleeding after operation in these cases is never much and the little is beneficial to the ears. I have operated upon a number of cases which had at the time a sub-acute otitis and never had a resulting suppuration since I relinquished the use of the galvano-cautery and adopted Jarvis' snare.

In these largely hypertrophied cases considerable difficulty will be experienced in passing the loop of the snare from the nose down into the pharynx.

The best way to avoid this is to pass a string through the loop of the snare and then tie both ends of the string to the end of a soft rubber catheter; if the catheter is then passed into the nose and down the pharynx it can be caught with a pair of forceps as it appears below the velum and drawn out of the mouth and with it the string which is attached to the snare loop; then the snare can be passed into the nose with one hand and drawn from the naso-pharynx into the pharynx with the other hand by means of this string and made to insinuate itself between the velum and the hypertrophy, and when it is in position, the string can be withdrawn from the snare loop.

BANDS OF TISSUE SEEMINGLY CICATRICIAL STRETCHING FROM THE POSTERIOR WALL OF THE PHARYNX TO THE EUSTACHIAN TUBE.

These bands to which I allude are seen in a number of cases, and are more or less numerous in different subjects. They stretch across the fossa Rosenmüller from the posterior wall of the pharynx to the Eustachian tube and are seemingly cicatricial and the results of previous inflammations. They convert the fossa into a reticulated depression and seem to act chiefly, if not solely, in a mechanical manner by retaining the mucus and rendering it difficult to clear the pharynx. Some of these bands are white and fibrous in their appearance and are evidently stretched and strongly pulling upon the inner wall of the Eustachian tube. I have found them apparently closing the tube by bending it, and by cutting them have relieved the tube and rendered its passage free.

I have again, upon the other hand, had cases where I had reason to suppose that they caused the tube to be unnaturally patulous. Where they are apparently strongly upon the stretch or retain the secretions in the pharynx to any objectionable amount, they should be divided by scissors or torn asunder with a blunt hook.

It may be pertinent for me to say here that in all the large number of cases seen by me at clinic and office, I have never met with an Eustachian tube which I could convince myself was occluded by stricture ; this seems strange, for from the conditions present we would be led to anticipate strictures. I have seen a number of cases which I was unable to inflate by any procedure, but upon examination the cause was found to be some tumor, hypertrophy, or growth, upon the removal of which the tube was made patent.

ATROPHIC OR CICATRICIAL RHINITIS WITH UNUSUALLY PATULOUS EUSTACHIAN TUBE.

These cases are often met with, and are always accompanied by a chronic catarrhal otitis which seems to be a natural sequence to the nasal difficulties. The treatment of them appears to have but little effect upon the condition of the ears, or deafness.

I see a number of these cases which have been treated by spraying, swabbing or douching with varying solutions of nitrate of silver and different other solutions of an astringent nature. It is needless for me to point out the fact that such treatment is contra-indicated, because of its marked tendency to increase the cicatricial condition.

SIMPLE SECRETIVE CATARRH.

I have purposely, until the last, left for consideration the more simple secretive or catarrhal cases; those which do not necessarily have the pathological conditions above described, for they are in my experience much less often met with, and are, I think, rather the exception in an otologist's practice; but they are met, and their non-surgical treatment is the same as that which the surgical cases above described would require after operation.

For convenience we may divide these cases into four varieties, as follows:

Simple mucous catarrh.
Muco-purulent or hyperplastic catarrh.
Fibrous catarrh.
Ozenic catarrh or catarrh with inspissated crusts.

In the simple mucous catarrh we have almost a purely mucous secretion: the mucous membrane is somewhat inflamed but not hyperplastic, simply an increase of the normal secretion and a slight granular or follicular pharyn-

gitis. If we have none of the pathological conditions described previously, such as deviated septa, etc., then it does not seem to exert a very great influence upon the ears, and it does not follow as a natural sequence that they are affected; if there is a chronic catarrhal otitis it is apt to be a local affair and to depend more upon the constitutional tendency or diathesis; but if these same simple catarrhs pass, as it seems to me clinically they do, into the second stage of proliferous or hyperplastic catarrh, and again into the sicca, dry, or atrophic catarrh, then the ears are affected by these conditions; but as this demands the study of chronic catarrhal otitis media, we must postpone its consideration.

MUCO-PURULENT OR HYPERPLASTIC CATARRH.

In this variety there is abundant muco-purulent secretion which continually demands removal with a more or less violent nasal exhalation. The mucous membrane is red and inflamed, also thickened, hyperplastic, and velvety: there may be polypi, localised hypertrophies, and œdematous tissue; in fact, it is the exception when there are not these complications present. There will be advanced follicular pharyngitis and sometimes the hyperplasia in the pharynx will be so considerable as to disguise the follicular enlargements.

The nose or naso-pharynx or both will be full of a yellow or greenish secretion and there will be considerable opposition to nasal breathing.

The ears are always found to be affected in these cases and usually as a chronic catarrhal otitis media with a decided tendency to a sub-acute otitis, which a slight irritation or acute exacerbation will at once develop into an acute suppurative otitis: others will have acute or chronic suppuration of both ears which it will always be difficult and sometimes impossible to cure without first treating the nose.

These are the class of cases in which the nasal douche causes such serious results: the use of which I have to combat even in these latter days of enlightenment and knowledge of their baneful results. The history is given over and over again "that while making an effort to clear the nostrils they suddenly became deaf, then had severe pain, and subsequently had a discharge."

I have spoken above of the surgical treatment of the complications in these cases, and where not complicated, the secretion must be liquified by means of a spray of exosmotic solutions: the cavities cleared of the secretions and nasal breathing encouraged.

By doing this the ears will be benefited greatly, and a suppurative otitis, which may have existed, will be induced to heal.

FIBROUS CATARRH.

In this variety the mucous membrane in appearance is not much different from that found in the last class, but the secretion is considerably changed in character and appearance; it is white, rarely yellow, never greenish and always excessively sticky and tenacious and it is almost impossible to remove from the nostril without the aid of a liquifying spray and cotton swab. The patient is almost incessantly trying to remove it by forcibly blowing the nose and with but little success. The ears are in these cases almost invariably affected with chronic catarrhal, subacute, acute or chronic suppurative otitis.

THE OZENIC CATARRH OR CATARRH WITH INSPISSATED CRUSTS.

This class is different from those already mentioned in the fact that the secretion, although considerable, coagulates or inspissates immediately, and forms dense crusts

which line the whole nasal cavity and often forms masses of foul smelling matter which entirely fill and occlude the nostrils. The odor is caused by the decomposing crusts and also to some peculiar blood dyscrasia.

The nasal cavities are almost always larger than normal and the turbinated bones are partially or wholly absent; active necrosis of these bones and ulceration of the mucous membrane is often present.

The removal of the crusts usually requires considerable exertion upon the part of the patient, and I have often labored for several minutes with spray, probe, and forceps to remove a crust which filled a patient's nostril.

The same story is often repeated in this class of cases as in the other, "that while cleansing the nostril one or both ears became suddenly deaf. Subsequently there was great pain which was relieved by a discharge from the ear and which discharge has continued ever since."

This condition of the nose always affects the ears and generally as a chronic catarrhal otitis with a tendency to the sub-acute condition; and acute or chronic suppurative otitis.

These patients can only be benefited by slow and painstaking labor to cleanse the nostrils with spray and cotton probe. Nothing else will accomplish the purpose. The tendency to coagulation of the mucus must be overcome with appropriate medication and treatment; unobstructed nasal breathing must be attained, and the result then to the ear disease, whatever its nature, will be surprising to those who have only treated these cases locally.

A word as to the local treatment of these secretive catarrhs and the treatment of surgical cases after operation. I formerly used powders of various and varying composition, caustic, astringent, sedative, &c., but I did not succeed with them as I desired, and have entirely relinquished their use and now only employ spray applications, coarse and fine as the case seems to need.

In treating the various catarrhal suppurative and granular conjunctivitis which we have in the eye, I noticed that whenever a caustic or strong astringent was applied to the conjunctiva, the mucous membrane was replaced by connective tissue and cicatricial conditions took the place of normal mucous membrane; to avoid this I began treating these cases with exosmotic, antiseptic, and alkaline solutions and no stronger caustics or astringents than ten grain solutions of nitrate of silver and glycerine and tannine in varying proportions.

I became perfectly satisfied that it was the better course and that normal mucous membrane took the place of granulations.

Acting upon these suggestions I adopted this mode of treatment in nasal difficulties accompanying ear diseases, and now I use only exosmotic spray solutions and rarely any stronger astringent than varying proportions of tannine and glycerine.

Of course my treatment is colored by the fact that I am chiefly taking care of the ears, and as with all these nasal difficulties we have an excited or inflamed condition of the middle ear and a tendency there to an acute process, I induce, for this reason, a powerful exosmotic action to deplete the tissues, liquify the secretions and wash them away, deeming this the best and the most natural procedure to reduce the engorgement of the tissues in and about the tympanic cavity, as it acts quicker than a sweat or a depleting cathartic.

After operations there seems to be no procedure better than this: and for the removal of the lingering traces of polypi and of polypoidal and hypertrophied tissue in the nose and naso-pharynx after operations, I know of nothing better or more satisfactory than varying solutions of tannic acid and glycerine.

And in many of the worst cases which I have had the

pleasure of operating upon and examining afterwards I have been happy to see that from inspection it would be impossible to say that there had been an operation performed or that there had even been the necessity present for an operation.

If we now look back upon what we have said it will be seen that nasal difficulties cause ear diseases in four principal ways.

1. The blood dyscrasia, or catarrhal diathesis which causes one, will also cause the other, and in these conditions there is no natural sequence whatever from one to the other.

2. The gradual invasion of one mucous cavity by the catarrhal disease of an adjoining and communicating mucous cavity; here is a natural sequence from the nose to the ear.

3. By the congestions suddenly occurring and often repeated which are brought about by the difficulty of clearing the nasal cavity, and that nasal difficulty which offers the most resistance to the free passage of air through the nasal cavities will cause the greater number and most serious diseases.

4. By the influence which peripheral nerve irritations of the nose may have upon the ear.

This latter is undoubtedly a present fact in many ear diseases, but I am not now prepared to state my views upon the subject.

These four facts being proven, our indications are simple and definite and as follows:

Firstly. To combat the blood dyscrasia.

Secondly. To cure the catarrhally inflamed mucous membrane and restore its normal function.

Thirdly. And if anything, the most important of them all, to free the nasal and naso-pharyngeal cavities from all obstructions and encourage nasal breathing.

DISCUSSION.

Dr. Beverley Robinson :—I will simply say that one or two points struck me. It would be difficult to appreciate a paper of this importance on merely hearing it read. Personally I have come to the experience of Dr. Tansley and others who regard the galvanic cautery one of the most useful instruments of combating a large number of nasal affections. I have been fortunate enough not to meet serious complications. In the last year or two we have made the cauteries in a more excellent manner, so that I think with some care we are not likely to have these attacks of suppurative otitis. It is a very painless method. With the use of a moderate solution of cocaine you can allay pain. I use it more at the present time than any other instrument.

With regard to the use of douches and sprays and local applications, my opinion in regard to the beneficial results of such applications is rather a doubtful one in many cases. I am of the opinion at present that douches through the nose and the nasal cavity are almost invariably useless and very frequently injurious. I have yet to meet with any cases permanently benefited by any form of douche. I have seen patients who have received temporary benefit from douches. I have met with complications from the use of douches. With regard to the sprays, I am doubtful in all forms of hypertrophic catarrhs. In regard to powders I am also somewhat skeptical at present. And I regard in the nose the use of the cautery as the most efficient method we have ; and in a large number of cases of hypertrophy and polypoid I should almost say it was a panacea.

Dr. Tilley :—As Dr. Robinson has referred to the solution of cocaine I would like to refer to a modification, that I have adopted,—the application of the powder itself.

I have used that in preference to the solution because it has been my misfortune to have two or three annoying circumstances associated with the use of cocaine when applied in the nose, either from its being swallowed or from its absorption. The application of the solution disappears in such a way that I cannot control it so well as I can control the powder. I have had two or three cases where it has given me great annoyance—my patient has had to stay in the office a considerable time with troublesome symptoms—in one case I had to send for the parent—so that I now use the application of the powder itself. I apply it by touching a flat probe with vaseline into the powder and thus apply the powder itself to the swollen part I wish to reduce or anæsthetize.

I am of the opinion that the paper of Dr. Tansley has given the idea of a frequent association of these nasal difficulties as causes of aural troubles. I am satisfied that they occur together; but that the one is so frequently the cause of the other I am disposed to doubt. I think the laryngologists would bear me out in that, inasmuch as they get a large number of such cases where there is no aural complication at all.

A question as to the age of the patient from whom the Doctor removed the pharyngeal tonsil is of interest. It is stated they are very rare after the age of 13 or 14; after 29 or 30 they practically never occur.

Dr. Robinson:—I am glad to hear the expression of opinion from some of the others in regard especially to the effects of adenoid hypertrophy on the ear. I have rarely heard an expression from those who know specially about aural troubles.

Dr. Pomeroy:—A single remark in regard to adenoid growths as causative of ear trouble. It is barely possible that surgeons do not appreciate the importance of this matter. I had a case some time ago that was a means of

instruction to me and a little humiliating as well. It was the son of a physician, a lad about 12 years of age. He had chronic suppurative otitis media with perforation. I treated him for a time and closed the perforation and he seemed about well. After a while another perforation—a small one—made its appearance, and after that I utterly failed in arresting the discharge. In the most friendly manner he was referred to another aural surgeon who treated him for a time utterly without success. I ought to observe that the father of the child was a throat specialist and had spoken about clearing out the vault of the pharynx of adenoid growths, which naturally relieved my mind from interrogating as to that cause of the ear trouble. Subsequently he went to Europe and consulted some specialist there, who found adenoid growths in the neighborhood of the Eustachian tube; on the removal of these the ear trouble entirely got well. That presented itself as a valuable point which we as aural surgeons are likely sometimes to overlook. There the adenoid growths in the upper pharynx were undoubtedly the cause of keeping up the discharge from the ear.

Dr. Tansley:—I am sorry I have no more questions to answer or arguments to meet in closing this discussion. I am afraid I am misunderstood in regard to the use of the galvano-cautery. I do not object to its use in the anterior nares: it does no harm there and anyone who prefers can use it in those parts: but I do object to its employment in the naso-pharynx: it is so apt to cause suppurative otitis where used to remove hypertrophies upon the posterior aspect of the inferior turbinated bone, the vault of the pharynx, or the posterior wall of the naso-pharynx between the openings of the Eustachian tubes. As I said in my paper, these cases where hypertrophies are found are apt to have an excited condition of the tympanum and it is more or less full of serum or sero-mucus and

but little irritation is required to throw the case into an acute suppurative process of the middle ear with its resulting damage to the hearing and its additional danger to life.

This being the fact, it is imperative upon us that we use the means of cure which are attended with the least consequences or dangers to the patient, and for that reason I recommend the cold snare and discourage the use of the galvano-cautery.

My observation of nasal difficulties in ear diseases is not a matter of two or three years, but began twelve years ago. My friend Dr. Webster saw me operate some seven or eight years ago and the result of my observations has caused me to take a very definite stand and come to very definite conclusions, as follows: that no one should treat ear diseases without a thorough knowledge of nasal and naso-pharyngeal difficulties; and upon the other hand no one should treat the nose and naso-pharynx without a thorough, practical knowledge of the ear; else upon one hand the otologist will fail to cure or relieve even a trouble which is curable by treating the nose; and upon the other hand the rhinologist may cause acute suppurations in the ear with all its attendant dangers to hearing and to life. Many of us have patients who are able and willing to pay a fee three times a week to an otologist and also to a rhinologist, but in my practice they are few and far between.

I hold that we should inform ourselves thoroughly as to the difficulties of each cavity and be competent to handle those cases in a scientific manner.

I was somewhat surprised to hear about the injurious effect of cocaine. I have used it in very large quantities and with never any bad results. Of course the patients are nervous, for they see what we are doing and see the blood run and perhaps faint, as well as do the friends and

assistants who are standing by. It is no uncommon thing for me to have a student faint and drop upon the floor at my elbow when witnessing me operate, and surely we cannot exempt a patient, upon whom we are operating, from a similar nervous condition.

Some time ago a gentleman from McKesson & Robbins called upon me to ascertain the dangerous amount of cocaine used; at the time of his calling I had just finished removing a number of mucoid polyps from the naso-pharynx of a girl only twelve years old (who, by the way, resides in this city), which had caused and were aggravating an otitis media suppurativa; I had been operating for an hour and had used by spray four drachms of a four per cent. solution of cocaine, being about ten grains, with no trouble or annoyance to the little patient excepting she would say, "More cocaine, doctor, please."

It is no uncommon thing for me to use half an ounce of a four per cent. solution in this way.

In answer to Dr. Tilley I would say that the patients in whom I have found the pharyngeal tonsil enlarged have invariably been under twenty-five years of age. Its hypertrophy seems to follow the same rule as that of the faucial tonsil; and I should not expect to find hypertrophies of either tonsil after thirty. Yet I have found and had to remove enlarged faucial tonsils in patients of thirty-five years of age, but never over.

On the other hand the polypoidal or hypertrophied condition of the posterior aspect of the inferior turbinated bone are found in the old as well as the young patients, and I have had to operate for its removal in patients as old as fifty-five years.

A CASE OF CEREBRAL ABSCESS, FOLLOWING EXTENSIVE NECROSIS OF THE TEMPORAL BONE, IN WHICH THE SKULL WAS TREPHINED BY DR. ROBERT F. WEIR. DEATH FROM SECONDARY HEMORRHAGE. AUTOPSY.

By Gorham Bacon, M. D., *New York, N. Y.*

Leopold F., aged 30, a fireman in an apartment house, came to the New York Eye and Ear Infirmary, September 27, 1887, on account of a chronic purulent discharge from the left ear, which he has had for two years. His general health has always been good and he denies having had syphilis.

An examination of the left ear showed that the auditory canal was filled with granulations and polypi, which prevented a view of the membrana tympani. The granulations and polypi were removed repeatedly with the snare and the roots cauterized, but they speedily returned. The patient was under observation during the following winter, although he did not always attend regularly and was very imprudent about taking any care of himself.

There was but a rim of the drumhead left and evidence of extensive necrosis of the tympanum and anterior bony wall of the auditory canal. A sinus was found in the anterior cartilaginous wall of the meatus, leading forwards and inwards and a large polypus was attached at the opening of the sinus, which was removed with the snare and curette. It was very difficult to keep the entire auditory canal free of granulations and polypi, so as to allow a proper escape of the purulent discharge, although different

methods of treatment were tried. The patient was given potas. iod. in moderate doses.

All through December he suffered considerable pain in the ear, which was especially severe at night, but at no time was there any evidence of mastoid disease. This state of affairs continued, the pain being less, however, at times. About January 10th there developed left facial paralysis. In the latter part of January the soft parts above the pinna were red and very tender on pressure, and an abscess soon formed at this point. This was poulticed and opened a few days later at a point just above and in front of the commencement of the helix, as at this point fluctuation was detected. A probe introduced entered a cavity leading downwards towards the articulation of the jaw. The pain was considerably relieved after evacuating the pus and the patient began to improve somewhat, although the polypi persisted in returning in the auditory canal.

The pain seemed to be but temporarily relieved. I explained to the patient the advisability of an operation, to which he consented, and he entered the Infirmary as an inmate on February 24th, 1888.

Operation. Ether given, the incision above and in front of the pinna was enlarged. It was found that an abscess cavity existed in front of the ear, close to the angle of the jaw, but the latter was not involved and there was a communication between the opening above the auricle and the sinus in the anterior wall of the auditory canal. This latter sinus was enlarged and a drainage tube introduced in the opening above the pinna and brought out through the sinus in the auditory canal, so that the abscess cavity could be properly drained. There was extensive necrosis of the anterior bony wall of the auditory canal and middle ear. I made an opening, with chisels, in the mastoid but found nothing. The patient

was much relieved by the operation. The drainage tube and abscess cavity were syringed daily with a solution of bichloride of mercury and the wound dressed with iodoform. The pain became less and he was soon well enough to go out every day and was improving steadily in general health. The discharge from the ear decreased and the auditory canal was more dilated.

A few days later, a counter-opening was made in front of the ear, as it seemed that the abscess cavity was not entirely drained. The patient said he felt well and seemed to be improving.

March 7th at 8 p. m. the patient complained of pain through the forehead and down the side of the neck, saying that it had been present all the afternoon and was quite severe. His bowels were regular and had moved to-day. He was given potas. bromid. grs. xlv. At 11.30 p. m., the nurse reported that the patient had been very restless since the house surgeon, Dr. Whiting, had made his rounds, and a few minutes before, he had pulled off his bandage, although he offered no objection when the nurse replaced it. Dr. Whiting spoke to him and asked him why he had removed the bandage; the only reply that he made to that and every other question, was, "Yes, sir," and this came after a manifest effort on his part to say something else, for he would mumble over some words to himself and then say, "Yes, sir." He gave his hand and put out his tongue when told to do so, but he was quite unable to articulate with any degree of accuracy. His pupils were normal in size and readily responded to light; he had no photophobia, no paralysis, either sensory or motor, save the facial paralysis which he had had for a long time. At the request of the house surgeon, he arose from bed and urinated standing and holding the urinal without any help from the orderly. The quantity passed, about six ounces, contained no albumen and had a specific gravity of 1020. The

temperature in his mouth was 102⅛° F., pulse 106, respirations normal. He had had no chill. He was given quin. sulp. grs. x in solution and tr. acon. rad. m. iv. He had also during the night, chloral hydrate grs. xv and potas. bromid. grs. lx. He was very restless during the remainder of the night and slept but half an hour. Heart examined and found normal. During the evening, the suppuration from the wound increased very materially.

March 8th, 9 a. m. Temperature 101° F., pulse 93, and respiration normal in frequency, rythm, etc. Pulse soft and compressible: cerebral condition about the same; he was still unable to articulate (ataxic aphasia) or express any idea, although he would move his hands or legs when told to do so. An ophthalmoscopic examination showed that the left eye was hyperopic and astigmatic, but there was no œdema, swelling or haziness of the nerve, the outline being as clear as if cut out with a punch. The whole fundus was clear, no exudation anywhere, but it seemed redder than usual. During the morning he was given three doses of tr. aconit. rad. m. iij. under which the temperature declined slightly. The dressing removed in the morning contained an unusually large amount of pus and there was bogging and swelling over the zygoma and malar bone, with considerable puffiness of the left lower eye-lid. Pressure over the swelling caused the pus to well up from the opening. A cerebral abscess was suspected. I called Dr. R. F. Weir in consultation, who saw the patient at 4.20 p. m. He said that there was certainly a cerebral complication; that it was probably an abscess of the frontal lobe, and advised first, that a free opening be made in the mastoid cells and that the boggy tissues over the zygoma be divided, for exploratory purposes.

The patient was anæsthetized. I drilled a hole in the mastoid, with chisels, above the opening which I had previously made, but found no trouble there except that

the bone was unusually hard. Dr. Weir then carried the incision up over the auricle and forward as far as the temporal artery. He introduced his finger and pushing it forward toward the zygoma, felt roughened and ragged edges of bone. He then carried the incision forward and on a level just above the zygomatic arch to the malar bone, cutting the temporal artery in its course. This loosened the auricle to such an extent that it practically lay over the patient's mouth. When the flap was turned down, there was discovered a large amount of disintegrated tissues, which were removed with the curette. It could not be determined whether or not the articulation of the lower jaw was involved. The pulpy material was removed until Dr. Weir came to a large opening in the squamous portion of the temporal bone, through which a strong pulsation could be both felt and seen. An aspirator was used and some pus drawn out. The cavity and all the surrounding tissues were scraped and then irrigated with a solution of hydrarg. bichlorid. (1-5000), after which an incision was made with a bistoury in the dura mater and a small amount of brain substance escaped, but no pus. A forceps was now introduced gently into the brain cavity and the blades opened slightly, when a quantity of pus (℥ss) escaped. The surrounding tissues were again washed with the bichloride solution, a drainage tube introduced into the abscess cavity and the portion of the wound extending over the face stitched up. The rest of the wound was packed with iodoform gauze and two small drainage tubes introduced. Powdered iodoform was used in the dressing and the whole covered with gauze and bandaged. During the operation, the branches of the fifth nerve at the foramen ovale and foramen rotundum were distinctly felt.

The patient was then put to bed, the operation having lasted an hour and a half. At 9 p. m., temperature $101\frac{2}{5}^{\circ}$ F., pulse 90, and respiration of a character closely simu-

lating Cheyne-Stokes. 12 o'clock, midnight; the urine was drawn by catheter and later during the night he passed it voluntarily twice, when given the urinal.

The patient took as nourishment during the night, two glasses of milk, about a pint of beef broth, and five ounces of whiskey. He had several lucid intervals between midnight and morning and asked why he had been changed from one ward to another and where the former orderly was, but soon after these inquiries he lapsed into his former semi-unconscious condition.

The following is the record of the night of the

Temperature.	Pulse.	Respiration.	Hour.
104⅕°	82	18	12.30 a. m.
	72	20	1 a. m.
	79	24	2 a. m.
103⅖°	72	24	3 a. m.
	68	18	4 a. m.
	70	24	5 a. m.
103⅗°	72	22	6 a. m.
	68	28	7 a. m.
102⅕°	70	26	8 a. m.
	72	28	9 a. m.
101⅖°	64	16	10 a. m.

Temperature always taken per rectum.

March 9. The patient has no paralysis and is able to sit up in bed; he is very restless and inclined to get out of bed. He has passed his urine when told to do so; the breathing is better than last night. Heart and chest examined and found normal. Pupils somewhat dilated, but respond readily to light. He takes the nourishment offered him.

Temperature.	Pulse.	Hour.
102⅖°	93	1 p. m.
102⅘°	87	3 p. m.
103⅕°	89	4 p. m.
103⅘°	87	5 p. m.
103⅕°	82	8 p. m.

At 4 p. m. the patient was given antipyrine grs. v and this was repeated every two hours until 10 p. m. His condition, however, remained unchanged.

The case was discussed with Dr. Seguin and it was decided best to trephine the skull over the third frontal convolution and make in this way more satisfactory drainage from above downward and bring the tube out at the perforation in the temporal bone.

The patient was put under ether again at 11 p. m. and Dr. Weir made an incision in the scalp almost vertically upward, beginning just in front of the ear. The cut was almost three inches long. He divided the periosteum and pushed it to one side and, using a trephine, removed a button of bone, 1 inch in diameter, from the frontal and parietal bones at their articulation, at such a point that the temporal ridge ran through the lower margin of the button. The dura mater was found very tense but not pulsating and was opened in a semicircular manner.

Some serous fluid was withdrawn by means of the aspirator when the needle was introduced into the brain, but apparently no pus. When the dressing was removed from the wound at the base of the skull, a discharge of thick pus followed the removal of the drainage tube from the brain cavity. A silver probe was passed down from the upper opening, through the brain and brought out at the base of the skull, the eye of the probe having been first threaded with a silk ligature. A drainage tube was then tied to this and drawn through from the upper opening and out at the lower opening. After this, all the surrounding tissues were bathed with a bichloride of mercury solution (1-5000), the wound in the scalp was closed with cat-gut sutures and the whole dressed as before with iodoform gauze.

During the first part of the operation, the pulse and respiration were of very poor quality, so that he required frequent stimulation with hypodermic injections of whiskey.

Tr. digitalis was also used several times and to stimulate his respirations atropia sulp. gr. $\frac{1}{50}$ was given.

The patient was then put to bed. When interrogated, his only answer was, "Yes, sir." During the night he had a bowl of milk and one of beef broth, and each hour an hypodermic injection of whiskey. He was also given during the night three doses of antipyrine (5 grs. each). He slept about an hour and a half. Here follows the record during the night of

Temperature.	Pulse.	Respiration.	Hour.
102⅖°	120	30	1.30 a. m.
102⅜°	108	30	2 a. m.
101⅘°	98	32	3 a. m.
101⅖°	98	30	4 a. m.
101¾°	89	32	5 a. m.
100¼°	84	30	6 a. m.
101°	84	30	7 a. m.
101¼°	86	32	8 a. m.
101⅜°	88	32	9 a. m.

March 10. The patient's condition was improved at 9 a. m. Respiration much more regular in its rhythm. No paralysis: urine drawn by catheter. The antipyrine given only when the temperature goes above 102°. Bowels moved by means of an enema. He was given regularly milk ℥ij, whiskey ℥ss every two hours. This was alternated with Liebig's beef extract made into a broth. During the afternoon, the patient became more sluggish and the temperature began to rise. This continued until 104⅕° was reached at 4 p. m., pulse being 98, respiration 38. Two hours later, the temperature began to decline and continued to decrease until 8 a. m., March 11, when 100⅖° F. was reached, the lowest point since March 7. During the night he perspired freely.

Here follows for the night and morning following:

Temperature.	Pulse.	Respiration.	Hour.
104⅕°	98	38	4 p. m.
103⅕°	99	40	6 p. m.
103°	102	44	6.30 p. m.
103⅕°	98	40	10 p. m.
	98	48	12 midnight.
102⅘°	94	33	2 a. m.
100⅘°	104	38	4 a. m.
101⅗°	93	34	6 a. m.
100⅘°	99	35	8 a. m.
100⅗°			11 a. m.

March 11, a. m. Patient's condition improved: temperature diminished: pulse of better quality and respirations having more depth: he shows signs of greater intelligence in many ways and takes an interest in his surroundings. When told to help himself to ice in a bowl beside him, he did as directed. There was no odor to the discharge when the wound was dressed. At midnight, the nurse discovered the bandage soaked with blood. He immediately called the house surgeon, Dr. Whiting, who found the bedclothing near his head also soaked with blood. He removed all the dressings, which were saturated with blood, but all the bleeding had then ceased. In the upper end of the drainage tube was a clot that extended into it nearly an inch. There was also a clot surrounding the lower end of the tube, but none in the tube itself. The edges of the wound looked well and there being some pus on the gauze dressing, this was removed and after washing the parts with the bichloride solution, the gauze dressing with iodoform was reapplied. Pulse 90 and very weak. Temperature 102⅕° F. He was given milk and whiskey: at 9.30 p. m. he had almost complete hemiplegia of the right side. Very sluggish and could not be roused. No further hemorrhage.

During the afternoon and evening, the temperature, etc., varied as follows:

Temperature.	Pulse.	Respiration.	Hour.
102⅕°	112	40	2 p. m.
103⅖°	120	44	3 p. m.
102⅗°	110	47	4 p. m.
98⅗°	94	40	7 p. m.
98°	89	42	8 p. m.
102⅖°	92	40	midnight.

When the temperature fell below 102°, antipyrine was discontinued.

At 1 a. m., the temperature was 103⅕°, pulse 102, and respiration 46. During the early morning, the temperature varied from 102⅘°–102⅕°, pulse from 102–110, and respirations from 46–38.

March 12. Patient weaker and sinking slowly; paralysis of right side complete. He can no longer take nourishment voluntarily. Whiskey and tr. digitalis given hypodermically. Pulse very rapid and feeble and at 9 p. m. he had a severe cerebral hemorrhage, while the house surgeon was beside him. The amount of blood lost was about one pint. Dr. Whiting removed the dressings at once. All bleeding had ceased: there was a large clot at the upper end of the drainage tube and a smaller mass at the lower end. When the dressing was removed, there was some bad odor to it. Dressings replaced after washing the wound as before. The patient had been sinking rapidly during the early evening and the temperature had increased rapidly until at the time of the hemorrhage it was 106⅘°: pulse 186, respirations 60. Antipyrine was given hypodermically but without effect on the temperature. Immediately following the hemorrhage, there was paralysis of the left side, but not complete. There was no sensation or motion below the waist.

Chest examined: bronchial rales, but no pulmonary

œdema; at 9.20 p. m., temperature 107$\frac{1}{5}$°, pulse 210, respiration 62. At 10.20 p. m., temperature 108°, pulse 227, respiration 66.

The patient died at 11.30 p. m.

Autopsy. March 13. There was a small amount of extravasated blood under the scalp around the wound in the cranium, but there was no extravasation under the dura mater, except a small amount at the Sylvian fissure. On disarticulating the jaw, some pus oozed out from the

FIG. 1.

This figure shows the greater part of the temporal bone, with the extensive necrosis as described in Dr. Ferguson's report. On the right side are shown the two openings made in the mastoid process with chisels. The bony auditory canal is entirely destroyed.

glenoid cavity. The brain and coverings were removed, together with the greater portion of the left temporal bone and submitted to Dr. Frank Ferguson, who made the following report: The portion of skull received is the greater part of the temporal bone, including the petrous portion, part of the squamous portion, and the lower middle half of

the left parietal bone. There is extensive necrosis of the temporal bone, just above the left glenoid fossa, involving both tables of the skull, measuring vertically 3 centimeters, antero-posteriorly 2 centimeters. The roots of the zygomatic process are also involved as well as the tubercle and a portion of the eminentia articularis.

The edges of the opening are thin and jagged. All traces of the external meatus are obliterated and at the

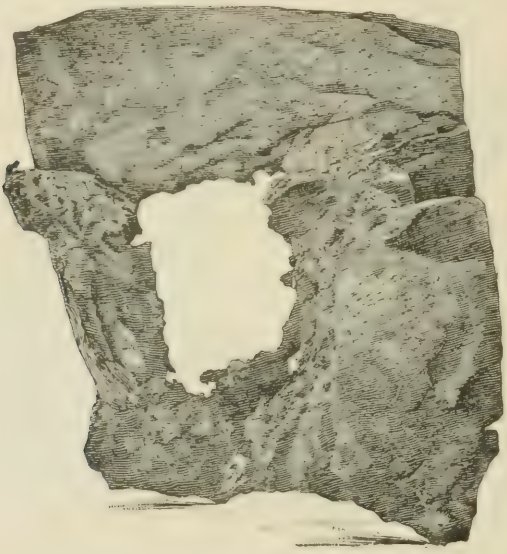

FIG. 2.

This figure differs only from Fig. 1 in showing to better advantage the relative size of the necrotic opening. On the right side the openings in the mastoid are seen, while on the left side is shown the commencement of the zygoma.

lower level of the necrosed area above described are found, surrounded by necrotic tissues, the ossicles. Posteriorly to this opening in the skull are two cup-shaped depressions in the mastoid process, which were made with the chisels, each of which is 1 centimeter in depth and occupying a position 2 centimeters behind the location of the origin of

the external meatus. These depressions are separated in a vertical direction by a ridge of bone, measuring about 1 centimeter. On the internal surface of the skull the opening involves the posterior part of the middle fossa, the groove for the middle meningeal artery terminating at the upper and anterior edge of the opening.

Brain. The vessels of the pia mater over the entire surface of the brain are congested, especially those of the left hemisphere. There is a drainage-tube imbedded in the brain tissue and extending from a point at the middle of the second temporo-sphenoidal convolution forward to the posterior aspect of the third frontal convolution. The tube traverses the outer and upper aspect of both branches of the Sylvian fissure, leaving a strip of pia mater 1 centimeter in width joining the tip of the operculum and the outer aspect of the base of the frontal lobe. Numerous vessels of considerable size are found torn in the path of this tube, and the lacerated brain tissue surrounding the tube is extremely hemorrhagic. Extending from the upper and anterior level of the ragged opening in which this tube is found, is an hemorrhage measuring in its antero-posterior diameter 7 centimeters, vertically $5\frac{1}{2}$ centimeters, and laterally 3 centimeters. Posteriorly it is on a level with the opening described in the skull and anteriorly on a level with the anterior opening of exit of the drainage tube.

Microscopical.—Numerous sections from the edges of the necrosed bone and the soft tissues in the neighborhood show simply granulation tissue and inflammatory products. On the surface and in the meshes of the pia mater surrounding the opening in the brain, through which the drainage tube passes, are numerous small round cells of inflammatory origin.

DISCUSSION.

Dr. R. F. Weir:—Here is a patient with preëxisting ear disease, attacked with ataxic aphasia and a certain amount of temperature elevation. There are two points to be considered, viz.: First make sure that it is not mastoid disease. This was done by cutting down on the mastoid which gave no evidence of disease. The second point was to eliminate or discover any sub-dural inflammation. This might have been done by continuing the same opening and making it deeper and opening the cranium above the petrous bone. On account of the healthy condition of the mastoid this was thought to be unnecessary. The anterior sinus was explored and it was found to lead to an opening in the sphenoid bone, where a pulsating mass was found. On puncturing this, pus was evacuated and subsequently the opening was enlarged and about half an ounce of pus and broken down brain tissue was evacuated. A drainage tube was then put in situ and the wound subsequently dressed. Between midnight and the following day, the patient had some lucid moments, but soon relapsed into the same condition he was in before the operation. Then after consulting with Dr. Seguin, we made by trephining a counter opening over Broca's convolution and put in a rubber drainage tube, bringing it out through the first opening. I specify this method, for I think it had possibly to do with the unfortunate result from secondary hemorrhage, on account of the proximity of the middle cerebral artery which was probably injured by the tube or by the string attached to it in its introduction, so that it gave way. This, however, may also have been the result of ulcerative processes.

I am much interested in these cases and think that, in chronic suppurative diseases of the ear, where there is low pulse, an elevation of temperature, and signs of cerebral

compression, we are certainly warranted in making an exploratory incision into the brain, especially as it is well known that in case pus is not found, it is very easy to replace the piece removed from the skull and close up the cavity as nicely as with the lid of a trunk and the damage so done is usually repaired with little or no disturbance.

DR. SEXTON:—I saw two openings in the specimen, one leading into the mastoid cellules and one above them. I did not hear any allusion to that and would ask for what purpose the latter was made.[1]

DR. BACON:—I should have said that I made the lower opening first at the time I introduced the drainage tube, after opening the abscess in front of the auricle. The operation was done with drills and the object was to see the condition of the mastoid. There was found no evidence of necrosis at the time of this operation, nor subsequently when Dr. Weir and I operated for the cerebral abscess. Just before the latter operation was performed of evacuating the pus from the cerebral abscess, at Dr. Weir's suggestion I cut down on the mastoid a second time, and I made the upper opening as shown in the cuts.

DR. SEXTON:—I am happy to hear Dr. Weir's remarks on this interesting case. I would like to ask the doctor one question which has a bearing upon this matter and has been discussed much in times past: would he, in cases where there were symptoms of pachymeningitis and mastoid inflammation existing at the same time, consider that any operation on the mastoid would be of service in arresting the progress of the pachymeningitis?

Dr. WEIR:—In cases where there is suppurative meningitis following an ear trouble, we should proceed to open the mastoid to exclude that; then go to the dural tissues through the dura and if one finds evidence of suppurative meningitis I think it a sounder surgical procedure to drain that and treat it as suppuration anywhere else, than to fold

[1]Only a verbal report of the case was made at the meeting at Washington.

the hands and let the thing go. It is a sound principle to give vent to pus if you can. This sounds rather wild. You might think you could not get a drainage tube between the brain and the dura. You can get a fair amount of drainage. In a case with Dr. Tansley, where we were expecting somewhat cerebral abscess, though the signs were obscure, we found in conducting the exploration, that we could proceed along on the anterior portion of the petrous bone for the distance of an inch outside and inside of the dura and for the same distance on the posterior surface too, by lifting up the lateral sinus. There is scarcely any limit to our manipulations of the exterior of the brain.

Dr. Theobald:—I might allude in this connection to a case which I reported in the Medical News, of Philadelphia, February, 1882. The case was one of acute suppurative inflammation of the middle ear. The discharge was, perhaps, too suddenly checked by the insufflation of alum, and shortly after this, well marked aphasia, accompanied by delirium, made its appearance. A seton was put in the temple: small doses of mercury biniodide were administered and a complete and permanent recovery took place. The patient was a lady about 50 years of age. I refer to this case simply to show that even when such alarming symptoms, indicating cerebral implication, are present, operative procedures are not always necessary.

Dr. Pomeroy:—I wish to offer a remark, to make a confession, perhaps. I presume I am in the wrong. Saturday I was asked to see a child of six or seven in consultation. It was a case of acute suppurative otitis media, with abscess over the mastoid. Three or four days ago this was opened; and the mastoid was found to be in a fairly healthy condition. The patient was not at all relieved by the operation; temperature somewhat elevated, though not excessively so; inclined towards coma. I was asked to see the child while in a comatose condition, pupils con-

tracted, and these were about all the symptoms you could extort from the case. The temperature had somewhat lowered. I said: "I do not see indications of mastoid disease. We have trouble, however, either in the mastoid or brain." I said: "It will not kill the patient to open the mastoid. If we find pus we shall have some satisfaction: and if we do not, it will not do harm and the patient will die if nothing is done." It was opened by the large sized Buck drill, passed in a little more than one-half inch, and moved about so as to remove a large number of the mastoid cells. The smaller end of a Weber probe was inserted into the opening with a view of making a communication with the tympanum, but was pushed through the osseous wall of the meatus near the tympanum. No pus was found anywhere and the patient died on the subsequent day. At the autopsy an abscess was found beneath the dura mater on the anterior and also on the posterior surfaces of the petrous portion. The bone was discolored. As there were no symptoms present by which the abscess could have been localized, I infer that it would have been improper to open into the brain cavity, especially as the discolored petrous bone pointed to a necrotic condition. It must be admitted, however, that latterly something has been done by the bolder surgeons for the relief of patients with brain abscesses. It may be that the otologist is unnecessarily timid.

Dr. J. O. Tansley:—I am interested greatly in this subject of brain abscesses, secondary to ear diseases, and have had several cases where this diagnosis has been made, but in only two where there was a post mortem obtained.

In each of these two cases there was a history of long continued suppurative otitis with polypi blocking up the external canal and meatus, and at the time of being seen by me, a more or less necrotic condition of the bones of

and about the middle ear. Both cases were under my care for several weeks and were studied carefully.

The first case had no paralysis or optic lesion, no dizziness or affection of co-ordination, no tender point upon percussion, and in fact no symptom whatever but a persistent headache, of brain abscess, excepting the turning of the eyes to one side (in this case they were turned away from the affected side) and this symptom I could not place much reliance upon because I could see no reason to account for it, abscess or no abscess. Post mortem showed a large cerebellar abscess, which might easily have been evacuated by trephining, and we were all sorry it had not been done.

The second case I studied equally carefully and it showed many symptoms of abscess, such as facial paralysis implicating the velum, intense headache, dizziness and affection of co-ordination to such a degree that he could not follow his occupation of car driver and had to help himself along the street by taking hold of the area railings, and was often taken for a drunken man. There was a tender point upon percussion but no optic neuritis, or ocular disturbances of any kind. Coma came early and the mastoid was trephined but nothing found. The parietal bone was trephined and search made for cerebral abscess and two days later the basilar bone was trephined to search for cerebellar abscess, but nothing was found. Post mortem showed a leptomeningitis and a small sub-dural abscess at the most inner point of the petrous bone.

I do not think that the question with us is if we shall or shall not operate in these cases, for I do not think there is an otologist within the sound of my voice who would not be willing to operate if he can be sure of his diagnosis, although we are as ophthalmologists and otologists not familiar with and afraid of blood.

The chief question is that of diagnosis. The area of the

brain, which is subject to abscesses secondary to ear diseases, is peculiarly tolerant of irritation and these abscesses have no symptoms of their own, but the symptoms are a mixed quantity and consist of the symptoms of the disease of the ear itself, of mastoiditis, of pachy- and leptomeningitis, of septicæmia, etc., in various and varying amounts, and it is difficult to come to any conclusion about them. As the question stands to-day we are only justified in operating if the patient is comatose and going to die anyway.

I do not know of any position more humbling than to stand beside a patient with hands folded and see him die. Let some one who is capable and competent and sees a number of these cases come and say what symptoms justify an operation and what do not.

Dr. E. E. Holt :—I was called in consultation with my assistant, Dr. Moulton, to see a patient who had chronic suppurative otitis media. She was a lady about thirty-five years old and had had a discharge from her ear since childhood. Several years before this time I had treated her and greatly improved the condition of the same, but the discharge did not entirely cease. At the time of the consultation she had taken cold ; the discharge had ceased ; the temperature was 104° F. The patient was nearly comatose. The patient was etherized and I chiselled down on the mastoid close to the upper part of the external meatus, nearly one and one-half inch before I reached a cavity where syringing in water would cause the same to appear in the meatus. In doing this I found I had to go through the walls of the lateral sinus, without however injuring the soft parts, this sinus making a decided turn outwards, as is observed in rare cases, one of which is pictured in Politzer's Diseases of the Ear. The next day pus appeared in the wound, the temperature went down and she eventually made a good recovery.

THE EMPLOYMENT OF BORACIC ACID, IN SOLUTION, IN THE TREATMENT OF OTITIS MEDIA SUPPURATIVA.

By Samuel Theobald, M. D., *Baltimore, Md.*

At the meeting of this Society, in July, 1887, the exhibition of a powder blower, designed for use in the treatment of diseases of the ear, by Dr. E. E. Holt, led to a somewhat prolonged discussion upon the employment of powders—and especially of boracic acid powder—in the treatment of suppurative inflammation of the middle ear. The weight of testimony appeared to be decidedly in favor of the view that boracic acid, employed in this way, is a valuable remedy: but, as to the best method of applying it, there was some difference of opinion. The majority of those who took part in the discussion seemed to regard insufflation as an effectual, and as the most convenient way of introducing powders into the ear; but, one speaker, at least (Dr. Seely), insisted that this method had proved entirely inefficacious in his hands, and that he had never seen benefit result, except when the powder was "packed" into the ear; while, on the other hand, Dr. Gruening maintained that even the insufflation of boracic acid powder was occasionally attended by serious consequences, and in support of this view related three fatal cases of otitis media, in each of which death resulted, in his judgment, from the use of boracic acid, the powder having been *packed* into the ear in only one of the three cases. None of the speakers but myself, so far as appeared, had, in the class of cases under discussion, used boracic acid in *solution*.

As to the manner in which the powdered boracic acid acts in suppurative otitis, the view was advanced by Dr. Knapp, and endorsed by Dr. Seely, that the good which it accomplishes is due chiefly, if not entirely, to its absorbent and drying properties. This view, which doubtless was based upon the well known fact that the laboratory experiments of Sternberg and others have, apparently, shown that boracic acid is among the most inefficient of germicides, I combatted, upon the ground that many of the most striking results which I had observed from the use of boracic acid in otitis media were obtained when it was employed in solution, and when, of course, its action could not have been explained in this manner.

In view of the impression which this debate left upon my mind,—that the value of boracic acid, in solution, in the treatment of suppurative otitis media, has not been appreciated as I think it should be,—I have thought it worth while to bring the subject to your attention again, and to reënforce, by citing several illustrative cases, what I then said regarding it.

It may, perhaps, be remembered by some of those present that the position which I took upon the occasion referred to was, that, while the insufflation of boracic acid powder is the most satisfactory way of treating the ordinary cases of chronic suppurative otitis media, which are usually attended by extensive destruction of the drumhead and the presence of granulation tissue in the tympanal cavity, and in which the complete restoration of the membrana tympani is hardly to be expected, better results can be obtained from the use of a saturated solution of the acid in cases, especially those of an acute character, in which the perforation in the drumhead is relatively small, and in which we expect, not only to cure the otorrhœa, but to bring about a closure of the perforation.

In the first described class of cases no plan of treatment

that I have employed has been so generally efficacious as the liberal insufflation, by means of a simple powder blower, of finely powdered boracic acid. In this way we can arrest the discharge, cause the granulations to shrink away, and bring about a cicatrisation of the lining membrane of the exposed tympanal cavity more promptly than by any other procedure with which I am acquainted. As was mentioned by Dr. Lippincott in the discussion at New London, we shall occasionally meet with cases in which there exists what may be termed a boracic acid idiosyncrasy,—cases in which the acid acts as an irritant, causing pain and swelling of the auditory canal: but, these are of such rare occurrence that they scarcely need be taken into account. In recent cases of otorrhœa, however, and in cases in which, though the discharge may have been of long standing, the destruction of the tympanal membrane is slight, I have for several years preferred to use boracic acid in solution rather than to apply it in powder. My reasons for this have been, first, that the healing of the perforation in the drumhead, which we anticipate in these cases, is not so sure to be brought about when the acid is applied in powder as when it is used in solution. In the large majority of *acute* cases the perforation will, of course, close, whichever method of application be employed; but, partly through mechanical interference and still more by its decided drying up of the parts, the powder seems, at times, actually to prevent the closure of the perforation, and even in some cases to cause it to increase in size, the surrounding membrane being so bereft of moisture and being rendered so literally anæmic that the reparative process is arrested and necrosis takes its place. And, it may be added that even the too liberal use of a solution of boracic acid will, not infrequently, produce this same effect.

A second reason for preferring the use of the solution to the insufflation of the powdered boracic acid is that, in

acute cases, it is unquestionably a safer plan of treatment. I have never seen untoward results from the insufflation of boracic acid, such as Dr. Gruening has reported, but I have met with one case (reported heretofore*) in which, though the patient ultimately recovered, very serious cerebral symptoms followed the insufflation of powdered alum in a case of acute suppurative otitis media. Without doubt there is some danger, as experience has shown, in filling the auditory canal with a powder, and especially in packing it into the ear, that the free escape of pus from the tympanal cavity may be interfered with, and that disastrous consequences may result therefrom, and it is manifest that in employing a solution this risk is avoided.

Still another reason for preferring the solution is that it is frequently desirable to have the treatment carried out at the patient's home, by unskilled hands, and this can be done much more satisfactorily with the solution than with the powder, since the domestic application of powders to the ear is, as a rule, at least in my experience, a very imperfect performance.

In prescribing boracic acid to be used in solution by the patients themselves, I commonly order several half-ounce powders, and direct that one of these shall be dissolved in a pint of hot water, and that from one-third to one-half of this shall be used to syringe the ear with once, twice, or three times a day, according to the character and profuseness of the discharge. In this way the ear is cleansed and medicated at the same time. The solution should, of course, always be warmed before being used. In my office practice I use a saturated solution (gr. xviii to ℥i), which I find it more convenient to apply with a pipette, after having freed the ear of discharge by means of the syringe or cotton holder and the Politzer bag.

*In a paper on "The Use of Constitutional Remedies in the Treatment of Ear Diseases." Med. News, Feb. 4 and 18, 1882.

As has been intimated, the too frequent application of boracic acid in solution may dry up the parts and arrest the healing of the perforation in the tympanal membrane in much the same way that the powder does, and for this reason it is all important that the effect of the treatment should be watched, and that as the discharge diminishes and the swelling and hyperæmia of the membrane lessen, the syringing or the instillation should be resorted to less frequently. In some cases, even when the otorrhœa is of long standing, a very few applications of the solution will suffice to check the formation of pus, and when this has been accomplished the intervals between the applications should at once be increased. In this way we favor the healing of the perforation, which does not progress satisfactorily unless the membrane be hyperæmic and somewhat moist. It is, perhaps, scarcely necessary to add that in many cases of otorrhœa the use of local remedies must be supplemented by constitutional treatment in order to obtain permanent results. I would especially call attention to the benefit which results in such cases from the long continued administration of the syrup of hypophosphites with iron, quinine, and strychnia, or of the kindred preparation, the syrup of the phosphates of iron, quinine, and strychnia,—two preparations which I have long employed with great satisfaction.

The following cases, which I give in brief outline, are selected from among others recorded in my note books because they illustrate well the method of treatment that I have commended:

Case I. Master B., about 12 years of age, recovering from measles, had a sharp attack of double otitis media. When first seen there was a profuse discharge of pus from each ear, which had existed for several days, and which showed no signs of abating, though, by the advice of the family physician, the ears were being syringed with a

solution of carbolic acid and the patient was taking a preparation of iron and calisaya bark. A moderate sized perforation was recognized in each drumhead. A solution of boracic acid (gr. xv to ℥i) was prescribed, with which the ears were to be syringed twice or three times a day, according to the amount of discharge. On the afternoon of the following day — the ears having been syringed four times in all — there was an appreciable diminution in the otorrhœa. Twenty-four hours later, the ears were found to be free from pus, the hearing much better, and the perforations apparently closing. Instructions were then given that unless the discharge re-appeared before my visit on the following day, the syringing was not to be repeated. The next day, there having been no discharge in the mean time, the left ear was found to be dry and clean, and the perforation in the drumhead apparently healed. In the right ear there was a little pus, and this was syringed again with the boracic acid solution. The next morning there was slight pain in the right ear, and this was followed by some discharge. The syringing was repeated, and in the afternoon I found the ear free from pain and containing no pus. After this no further treatment was required; both ears remained dry and continued to improve, and in a short while the membranes had regained their normal appearance and the hearing was as acute as before the attack.

Case II.—A little girl, daughter of Mrs. H., had suffered from recurrent attacks of otitis media accompanied by otorrhœa, the right ear only being involved. There was evidently a small perforation in the tympanic membrane, although its exact location could not be made out. A fifteen grain solution of boracic acid was prescribed, with which to syringe the ear once or twice a day, and she was also put upon half drachm doses three times a day of Wyeth's elix. of phosphate of iron, quinine, and strychnia.

The case was not seen again for nine days, when the ear was found to be clean and dry and the perforation closed. The syringing was then discontinued, and she was directed to report again if there was further trouble; but she did not have occasion to do so, though other members of the family were subsequently under my care.

Case III. Master J. S., aged about 6 years, when first seen had a profuse discharge of pus from one ear from a recent attack of otitis media, said to have been due to "cold." A ten-grain solution of boracic acid was ordered with which to syringe the ear once a day, and in place of the syrup of iodide of iron, which he had been taking in eight-drop doses, three times a day, twenty drops of the syrup of phosphate of iron, quinine, and strychnia were prescribed. The discharge not having diminished after two days, I directed the syringing to be done twice a day, and three days later, as the otorrhœa was still unchecked, I increased the strength of the boracic acid solution to fifteen grains to the ounce. In three days more the discharge had ceased, and the use of the boracic acid was discontinued; and in a short time after, the membrana tympani had regained its normal appearance.

Case IV. Miss B., about sixteen years of age, was suffering from a painful relapse of otitis media, with profuse purulent discharge from each ear. I directed the ears to be syringed three times a day with a fifteen-grain solution of boracic acid, and prescribed ten grains of pyrophosphate of soda, to be taken every three hours. In three days the discharge from the right ear had ceased, not to return, and the perforation in the membrane had closed. After this only the left ear was syringed. Six days later, although the left ear was not quite dry, there was no external discharge from it, and I directed that the syringing should not be repeated unless the otorrhœa returned. On the following day there was some pain in this ear, and a

return of the discharge. The use of the boracic acid, however, was neglected. It was resumed three days subsequently; but, after having been used for another period of three days, was discontinued, as there was a threatening of furuncular inflammation within the orifice of the auditory canal; and in its stead the ear was simply kept clean by being syringed with warm water and castile soap. The inflammation of the walls of the canal now subsided, and in four days the discharge from the middle ear had ceased and the perforation in the membrane had closed. The improvement after this was continuous, and in a short time the hearing regained its former acuteness and the membranes returned to their normal condition.

Case V.—Miss F., aged seventeen; intermittent discharge from right ear of long standing; large central perforation of the drumhead; strumous diathesis. Patient was put upon one drachm doses of syrup hypophos. compos. cum quin. et strych.,* and a saturated solution of boracic acid was instilled into the ear, at first every four days and subsequently at longer intervals. The first application arrested the discharge, and the subsequent instillations were made only when the appearance of a little pus in the bottom of the auditory canal seemed to call for them. The cleansing of the ear was done by means of absorbent cotton. Under this treatment the perforation gradually diminished in size, and there was every indication that it was about to close, when, after an interval of two months without the application of the boracic acid solution, during which time the ear had remained free from pus, there was, without apparent cause, a sudden re-appearance of the discharge. The next day, after freeing the ear of a considerable quantity of pus, I applied, instead of a saturated solution of boracic acid, which I thought might possibly interfere with the healing of the perforation, one which

*Prepared by Sharp and Dohme, Baltimore.

contained only five grains to the ounce. Without further treatment, the ear was found to be clean and dry when examined three days subsequently, but the perforation was unmistakably larger than before the recurrence of the discharge; and, as though disheartened by the setback it had received, the process of repair, which before had been slowly building up the gap in the drum-membrane, made no further headway, but rather went backwards, so that in time the perforation was as large as before the treatment was commenced. However, to offset this, I may state that an interval of more than two years has elapsed since this application to the ear of a five-grain solution of boracic acid, and during this time the discharge has never once reappeared.

DISCUSSION.

Dr. Tansley :—It is very singular to me that one doctor's experience differs so much from that of another and I have often wondered if the same disease in different sections of country did not act differently under similar treatment.

In regard to the use of solutions of boric acid I do not have the slightest success with them. I have never seen the slightest favorable action upon granulations or polypi of the ear by solutions of boric acid or the powder of boric acid used dry, and never think to depend upon it, but always cauterise and let the patients use the powder themselves several times a day.

I do not think that boric acid acts as an antiseptic in suppurative otitis, but dries up and bleaches the parts much as glycerine and tannic acid applications in gynecology. It acts as an exosmotic and causes a watery discharge from the ear, liquifying the pus and washing it out; and it is a common expression for my patients to say, "Doctor, my ear did not discharge until you put that powder in and then on my way home it discharged pure water."

In regard to boric acid causing increased inflammation, there is no necessity of saying there is an idiosyncrasy to account for the fact; it is perfectly simple to me. I am seeing these cases daily.

Boric acid causes, as I said before, an exosmosis, and if there is any tendency to eczema in the patient, every irritation or inflammation will partake to a greater or less degree of an eczematous character and of course in this difficulty as we all know the applications should be drying in their nature and protective, and anything causing an exosmosis, even washing with warm or cold water, is contra-indicated: boric acid will always make these cases worse.

I recognized this fact early in my use of this very valuable remedy, and now never apply it where there is any eczema present and never have any bad action from the use of boric acid.

I use the pure boric acid very finely pulverized and simply blow it lightly in the ear and direct the patient to do the same.

In regard to using powdered alum in an ear I never do it excepting where I desire to harden a soft and easily bleeding polyp, preparatory to removing it with the snare. I do not use it because it creates a coagulum which blocks up the canal and retains the secretions. I do not use iodoform for the same reason,—it is so difficult to remove when once it has been blown into an ear, because it is so little soluble in the liquids of the body.

In inflammatory diseases of the eye I make use of pieces of linen wet with a saturated solution of boric acid and occasionally I used to have trouble during the night when the cloths were not applied as regularly; in seeking for the cause I found it to be the sharp crystals of boric acid left upon the face by the evaporating water and which were rubbed into the eye: to avoid this I have the face and eye washed carefully with pure water occasionally during the

night and now have no annoyance. This condition of sharp cutting crystals it seems to me would obtain in the ear when using the saturated solutions and contra-indicates their use to my mind.

Dr. Theobald :—In regard to the term "boracic acid idiosyncrasy," which I employed, I think it is an apt one. In most cases, whether employed in solution or powder, boracic acid causes no irritation, but in exceptional instances the irritation from it is excessive. We do meet—I have one case in my mind—recurrent otorrhœa with perforation of the drumhead in which the insufflation of boracic acid was followed upon more than one occasion by diffuse inflammation of the auditory canal. This case I would regard as one presenting the boracic acid idiosyncrasy. In regard to Dr. Tansley's suggestion, that these so-called cases of idiosyncrasy are due simply to the presence of eczema of the auditory canal, I can only say that boracic acid is the most valuable remedy I have used in eczema of the auditory canal. If I have a case of this sort I use boracic acid or boracic acid with the oxide of zinc with the utmost confidence that it will act favorably.

In regard to boracic acid crystals having an irritating effect by their presence in the auditory canal such as they would cause in the eye, it seems to me that the comparison is entirely erroneous. Of course if a hard mass of the powder became wedged in the canal so that the movements of the jaw might make it felt mechanically, trouble might ensue. But so far as irritation from the simple recrystallization of the acid after its insufflation into the ear is concerned, I never think of such a thing. The best indication I can have that the boracic acid is acting favorably, is to have the patient come back to me with a considerable part of the powder which I have previously applied, dry in the ear, and whether it be crystallized or not, its presence there gives me no concern.

Dr. Sexton :—I have a word to say in regard to the matter suggested by the remark of Dr. Tansley. It would seem from statements made that the disease varied in different localities in the country and it occurred to me that an explanation might be found in the way he looked at this matter personally. I would mention a case that occurred a short time ago. A gentleman sent me a patient with an abscess of the mastoid which he opened and it had kept running for several years. The membrana flaccida was perforated; the membrana vibrans partly adherent and largely gone; the atrium and attic full of granulation tissue, as were also, of course, the mastoid cells. In order to get drainage in one direction, namely, out through the external auditory canal, I excided the diseased tissues and there was apparently a very free outlet. The opening in the mastoid cortex began to close. I soon found that a good deal of granulation tissue was filling up the tympanum again and threatened to obstruct the drainage. It occurred to me to question the patient about his habits of life. I found that he was very careless in this regard: drank freely and ate without care. I insisted upon his letting alone stimulants, limiting his diet, and stopping almost entirely the use of tobacco. He was advised to take a morning dip and a great many things in a hygienic way, to bring up his general health and make him less liable to take cold and have catarrhal invasions about the head. The result was that in a few weeks the granulation tissue ceased to form and the patient began to get better and better. He had no local treatment whatever. I find that in the last two or three years I have directed my attention more and more to these general matters and put less and less medicine into the ear. Have used salicylic or boric acid probably half a dozen times in as many months.

Dr. Burnett :—I think so much of boracic acid in powder that I would add a word or two. I have ceased to use

it entirely in acute cases in which symptoms of pain and tenderness remain, because in such cases the patient complains either of continuous pain or considerable discomfort at the time. As soon as the great sensitiveness passes by I find I can use it in powder. I use little and put it in lightly. I have not been able to find so much success in the solution as Dr. Theobald has. I have, I think, been able to dissipate the presence of polypoid growths that have not assumed the pedicellate condition. It has been my observation that, when the mucous membrane has the appearance of a raspberry,—when the granulations are not in pedicellate condition,—then the boracic acid acts well.

Dr. Webster:—My experience accords with Dr. Burnett's. Cases in which I have used powdered boracic acid in the acute stage of the middle ear trouble have been made decidedly worse. Pains increased as well as secretion and inflammation and I decided never to use it where there was acute inflammation of the middle ear. I have used the solution of boric acid in alcohol in one case, a case that was getting along very well,—chronic suppurative otitis media. Some friend of mine advised the solution and I tried it; and the patient, treating himself at home for a week or ten days, came back considerably worse, and I went back again to the powder with decided improvement.

Dr. Tansley:—I do not use it in acute cases. I am afraid I might be understood to do so.

Dr. Theobald:—It is these acute cases in which these gentlemen have found it not a desirable remedy, that I found it to act so well. Those are the cases, particularly, in which the boracic acid solution is especially valuable. If in these cases, instead of applying the powder the gentlemen will try syringing the ear with a fifteen grain solution of boracic acid, I think they will find it a most efficacious plan of treatment.

Dr. Burnett:—We must not lose sight of the fact that

fifteen or eighteen grains is much weaker than the powder. I think an acutely inflamed ear might endure the solution, if it could endure a chloride of sodium solution of that strength. But in using fifteen grain solution of boracic acid, when an evaporation takes place certainly a recrystallization occurs unless the ear is running a great deal and can wash out what would otherwise crystallize. If it can irritate at any time of course it would do it then. I have seen crystals form after the use of the solution.

Dr. Pomeroy:—This subject is an interesting one to me. Two or three years ago I had a great deal of faith in it. My experience is that the powder is more effective than the solution. It will not always do what is claimed for it, but it will do a great deal. I have, however, much less faith in it than formerly. One point: in accordance with my own idea I have been teaching in regard to acute inflammation of the ear cavity, that while you have evidence of considerable hyperæmia of the tympanum, do not use astringents of any kind whatever, unless salt and water, and the mildest possible cleansing agents, and wait for the hyperæmia to subside: not forgetting the tendency of the ear to cease discharging on the subsidence of the inflammation. These remarks apply only to acute cases.

Dr. Tilley:—The use of the term "astringency" to boric acid, I think may lead to a misunderstanding. I do not understand how it can be classed with the commonly called astringents. I would like to suggest a possible explanation of the mode of action of boric acid under these circumstances. We know positively that certain microbes have such a sensitive organism to an acid or alkaline reaction that the faintest possible exhibit of acid reaction is sufficient to absolutely cause these microbes to cease to live: and I venture to suggest that in all possibility where boric acid acts in causing cessation of an inflammation, that it may be due to its influence in this respect: in developing a

peculiar form of acidity. That it has a large amount of influence is certainly testified to by those who treat the genito-urinary organs. Saturated solution of boric acid is recognized as very efficient in certain inflammations of the bladder.

I would like to feel sure about the formation of boric acid crystals being found in what was given as a saturated solution of boric acid in biborate of soda. There is a peculiarity about this combination: whereas boric acid is soluble not to exceed five per cent., yet at the same time there is formed, in solutions of boric acid with borax, a tetraborate of soda which is exceedingly soluble. The solubility of this combination is so great that it would be a little unusual for crystals to be formed under circumstances stated.

Dr. J. M. Ray:—I have recently used what is said to be a super-saturated solution of boric acid, made by the addition of calcined magnesia. In this way forty-five grains of the acid can be suspended in an ounce of water, making a perfectly clear solution. I have used it in the ear instead of the saturated solution.

It is my custom in cases of chronic suppuration where there is considerable granulating tissue or small polypi present, to use a mixture of boric acid and alcohol. It is best when commencing this method to use equal parts of alcohol and water and any quantity of the boric acid. Shake well and drop into the ear warmed. After a short time the proportion of alcohol can be increased, so that eventually a mixture of alcohol and boric acid is used. The alcohol evaporates and on the next examination the fundus of the ear and the granulating tissue are seen to be covered by a layer of boric acid. A mixture like this will penetrate the middle ear cavity and its recesses much better than the powder, and in addition there is obtained the very marked effect of the alcohol on the granulating tissue and polypi.

A CASE OF CHRONIC SUPPURATIVE OTITIS MEDIA, WITH ABSCESS IN THE NECK AND DESTRUCTIVE PURULENT IRIDO-CHOROIDITIS, PROBABLY METASTATIC.

By Oren D. Pomeroy, M. D., *New York, N. Y.*

Mr. G. H. F., æt. 56, during the month of March last, had an attack of otitis media suppurativa of the right ear, which became convalescent after a few weeks of treatment.

Early in July Dr. J. W. Warner, of New York, was sent for: he found the patient with a severe pain on the right side of the neck, extending to the shoulder, in the region of the scalenii muscles. The slightest movement of the head from side to side caused great pain; he could lie only on his back: it seemed rheumatic, worse at night but there were exacerbations in the morning. Pulse 80, temperature 100°. He continued in this condition for five or six days, receiving appropriate treatment, when he complained of deep-seated pain in the right eye with impairment of vision, and some redness of the globe; the doctor diagnosticated iritis.

I first saw the patient at Dr. Warner's suggestion on July 9th. The patient had iritis with posterior synechia so far developed as to compel me to state that iridectomy might become necessary. The previous treatment had fulfilled all the indications. The pain in the eye was very moderate and photophobia was almost absent. One week afterwards I was called, and found pus in the anterior chamber, which seems considerably organized: the scleral conjunctiva was everywhere chemotic, the swelling not being great, but

quite firm. The symptoms of suppurative irido-choroiditis seemed to be all present, though the pain was moderate. Naturally an unfavorable prognosis was inevitable.

My attention was also called to a discharge from the ear which had existed since two or three days and was painless. The drum-membrane was perforated, and the perforation whistle could easily be elicited by Valsalva's method of inflation. The pain in the neck was not excessive, but he still could not move the head from side to side with comfort.

The ear was treated with a disinfectant wash and a forty grain solution of arg. nit. was dropped into the meatus. At this time there were some irregular rigors and the temperature was 101°, pulse 100.

The patient was given quinine and general supporting treatment; the cornea was punctured and some of the pus was evacuated, but it was so far organized as to not flow out freely.

The corneal opening was maintained by the occasional passage of a probe through it. Hot water was used to bathe the eye many times a day. After about three days a considerable red swelling appeared in the upper lid near the outer canthus. Another couple of days showed it to depend on an effort to rupture the globe in this neighborhood. This resulted in a moderate discharge of pus, but it was apparent enough that the globe was full of purulent material. I expressed the opinion that the eyeball should be enucleated. Dr. David Webster was called on for his opinion. He concurring in the opinion I had previously expressed, enucleation of the globe was determined upon, and on the following day, being a week from the time pus was first observed in the anterior chamber, was done with the assistance of Dr. Webster and Dr. Warner. The subconjunctival adhesions were extraordinary, requiring an unusual amount of dissection to separate them. Eyeball

partially collapsed and filled with pus. On awaking from the ether the patient being moved a little complained of its hurting his neck. He seemed to do well after the enucleation for a period of two weeks, when the neck became such a serious matter, and the Doctor, suspecting the existance of pus, I was called in and found a local and painful swelling beneath the trapezii muscles, its longer diameter being in a vertical direction extending from near the shoulder to within two inches of the ear and anterior to the mastoid process. An exploring needle was introduced a few days previously but no pus was found. There was obscure fluctuation, and we deemed it proper to make a deep incision, which was done by Dr. Warner, and resulted in the finding of pus, natural in quality and amounting to about two ounces.

The meatus was at this juncture found filled with pus, which had evidently proceeded from the original pus cavity. Effort was made to determine whether the pus cavity communicated with the tympanum or with the meatus only. This could not certainly be determined. A finger was passed into the incision, and the cavity was found to extend upward to the inferior wall of the osseous meatus, where rough bone could be felt. Drainage tube used with antiseptic dressing and irrigation.

By September 17th the drum-membrane is healed, and the incision nearly closed, being well healed at the bottom. Patient's hearing is several inches for the watch, and good for the voice.

This case is evidently rare. In the American Journal of the Medical Sciences for 1884, p. 417, Dr. Chas. J. Kipp reports three cases of Metastatic Irido-Choroiditis, two of which depended on a suppurating ear. The first case resulted in consequence of an acute suppuration of the right ear, the right eye being affected. The other eye was normal. The second case was also of the right eye.

while both ears were affected with a chronic suppurative otitis. All the eyes affected were destroyed, but the globes were left in a phthisical condition. In his first case there was a pleuro-pneumonia of the right side concurrently with the ear attack and thought to be dependent on the ear affection.

Dr. Kipp had two explanations for these attacks; one, that the septic material from the suppurating ear had been carried into the circulation, thus reaching the eye, or that a meningitis had accompanied the ear trouble, and had extended itself along the sheath of the optic nerve to the sub-choroidal lymph space. In my own case and in the first of Dr. Kipp's, it would seem as though the inflammation had extended directly from the ear to the meninges, except in Dr. Kipp's case there was a pleuro-pneumonia to be accounted for.

His second case naturally can be explained by one of these theories as well as the other. Another interesting fact appears, that very soon after the eyes were attacked all perception of light was abolished. In my own case total absence of light perception appeared before the affection had fully developed.

DISCUSSION.

Dr. Webster:—As the doctor has informed you, I saw this case twice; once on Saturday in consultation, and on Sunday, the next day, to assist in the enucleation of the eye. When I saw him in consultation I concurred in the conclusion that Dr. Pomeroy had arrived at,—that the eye had better be enucleated for the reason that the perception of light was already lost. The cornea had already become to a certain extent atrophied. Its diameter was not more than three-quarters the diameter of the other cornea and there was a good deal of swelling of the ocular conjunctiva; and as the man depended upon being able to

work for his living — could not afford to "lay up" long enough for the eyeball to atrophy—there was a question between curing by enucleation in the course of a week or having him go five or six weeks unable to work, as he had to write for a living. At that time he complained very much of his neck, and the slightest movement of his head gave him the most intense agony, so much so that that prevented me from making a thorough examination of his neck. I took it for granted that Dr. Pomeroy and his physician knew about that and that it was a case of muscular rheumatism. He had caught cold in his neck. At the enucleation, next day, so great was the sensitiveness of his neck that he remained rigid while the ether was being given and the first thing he complained of on recovering consciousness was that we moved his head and hurt his neck. I believe that this trouble with his neck came on simultaneously with the inflammation in his eye. I have very little doubt myself that they were both metastatic suppurative inflammations from the chronic suppurative inflammation of the middle ear.

INFLUENCE OF THE USE OF THE TELEPHONE UPON THE HEARING POWER.

By Clarence J. Blake, M. D., *Boston, Mass.*

The assertion made by the writer several years since that the habitual use of the telephone would be prejudicial to the hearing in many cases where the hearing was already impaired, was based upon the well-known facts of the process of accommodation in the middle ear for the transmission of tones of low intensity, of the susceptibility of the percipient apparatus to shock from sharp sounds of high intensity under the conditions of that process, and upon the results of measurements of the vibrations of telephone discs made for the purpose of determining approximatively the loss of power between the transmitting and receiving telephones. These experiments, the results of which were embodied in a paper read before the British Society of Telegraph Engineers in London in 1878, consisted in connecting two hand telephones, similar to those at present in general use, by means of flexible wires, and recording the excursions of the discs of both the transmitting and receiving telephones by means of fine platinum wires tracing upon smoked glass. The excursion of the transmitting telephone disc without the magnet was first recorded, the average for all the readings for a constant tone of 448 v. s. measured under the microscope with micrometer eye-piece being 0.2625 millimeter. The deflection of the centre of the disc under magnetic attraction was 0.061 millimeter, the result of this being a decrease of the excursion in response to the same tone to 0.180 millimeter, a difference in the length of the excursion of 0.0725 millimeter, or about 27.65 per cent.

The movement of the receiving disc as recorded on the smoked glass was so slight that a larger number of tracings was made, the average of which was, however, always within 0.02 millimeter, and controlling tests were made by means of a micrometer screw, reading to one-thousandth of a millimeter, connected with a delicate galvanometer, the results gained confirming the previous measurements of the transmitting disc and determining the average excursion of the receiving disc at 0.0135 millimeter, a loss in motion of *92.9* per cent. between the two telephone discs. This loss of intensity is in a measure compensated for by the effort made in the ear itself to accommodate itself to the transmission of tones of low intensity, which effort in its prime degree can be maintained, as shown by experiment, for little more than fifteen seconds, at the end of which time the symptoms of fatigue (in a decrement of the hearing) begin to appear.[1] Estimating the amount of power in sound transmitted to the ear from the receiving telephone as but 7.1 per cent. of that which actuates the transmitting disc, the compensation required of the ear would seem to be considerable, particularly when it must be sustained for a long period, but when the attempt to estimate the percentage of the loss of the difference between consonant sounds of nearly the same logographic value and consonant sounds moreover the pneumatic value of which results in a damping of the transmitting disc—by

[1]Under these conditions the ear becomes peculiarly susceptible of the shock imparted by such sharp metallic sounds as are constantly liable to occur in the practical use of the telephone from sudden variation in current and the breaking of connections, the danger to the ear already impaired in its accommodative power by a middle ear disease being both from the tax upon its enfeebled accommodation and from the sudden shock of sound for protection of the ear from which there can be no voluntary preparation, the danger to the ear being always greater from such forms of receiving telephones as are attached to the head, a proper precaution being that the telephone should be held at a short distance from the ear, or at an angle of about forty-five degrees in front of it.

driving it further toward the magnet—it is infinitely greater.

Soon after the experiments here mentioned were made, the microphone transmitter using a battery current had come into general use and it had seemed advisable to review the subject in the light of experiments more delicate and more accurate than the crude measurements made ten years ago.

For these I am indebted to Prof. W. W. Jacques, of the American Bell Telephone Company, who, connecting a Blake transmitter with a hand telephone by a wire circuit and comparing the values between sound aerially and telephonically transmitted as measured by the distance from the ear, came to the conclusion that the speech given out by the receiver on a short line is approximately $\frac{1}{10000}$ of the loudness of that going into the transmitter.

By a still later series of experiments, for which I am indebted to Professor Jaques, the extent of the accommodative power of the ear and correspondingly the demand made upon it is still further illustrated. Connection was made between the New York and Boston offices of the Telephone Co. and the Laboratory of the Massachusetts Institute of Technology in Boston, by means of a complete metallic (copper) circuit. The distance over this wire from the New York to the Boston office was two hundred sixty miles, and from the Boston office to the Laboratory of the Institute, two miles. A Hunnings transmitter was placed at each of these stations and at the Institute of Technology, an electro-dynamometer was also included in the circuit.

On speaking into the transmitter at the Institute the electro-dynamometer gave a deflection of 22 mille amperes, speaking into the transmitter at the Boston office the current was 0.48 mille amperes, and speaking at New York it was 0.02 mille amperes: the current was thus eleven hundred times as strong from the transmitter at the Insti-

tute as from that in New York, and yet the conversation was distinctly audible in both cases, and the ear did not recognize any enormous difference in the intensity of the sound.[1]

These facts so amply confirm the previous statements that they should be well borne in mind, especially since the telephone is an instrument the use of which will, in the future, increase rather than diminish, and since it is, moreover, not likely with our present knowledge to be essentially improved, the principal gains in clearness and distinctness of sound transmitted having to come from improvements in the means of communication rather than from changes made in the receiving instrument itself, all attempts at damping the high metallic overtones and improving the qualitative distinction between the consonant sounds by changing the structure of the receiving telephone having resulted in a corresponding loss of that intensity, of which, as has been shown, there is so little to spare.

DISCUSSION.

Dr. Burnett :—Several patients under treatment for chronic catarrhal deafness have told me that in their opinion the use of the telephone had made them worse. Of course I cannot prove that, but that was their opinion. They were intelligent men,—men using the telephone frequently in their business, in their offices; and their testimony was that the use of the telephone had injured their hearing. I think the strain on the ear may have hastened the failure of hearing.

Dr. Pomeroy :—I have a patient who complained that the use of the telephone fatigued her very much and sometimes produced noises in the ear. She was inclined to believe it did her harm because, besides the symptoms enumerated, it made the ear worse in a general way.

[1] Extract from letter dated Boston, June 20, 1888.

Yours as ever:
E. H. Williams

TRANSACTIONS

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Dr. J. F. Noyes, ... Detroit, Mich.
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Dr. William W. Seely, . . S. E. cor. 4th and Broadway, ... Cincinnati, O.
Dr. Ralph W. Seiss, ... 49 North 17th St., . . . Philadelphia, Pa.
Dr. Samuel Sexton, ... 12 West 35th St., ... New York, N. Y.

Dr. Henry L. Shaw, ... 159 Boylston St., ... Boston, Mass.
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Dr. George Strawbridge, . 1500 Walnut St., ... Philadelphia, Pa.
Dr. T. Y. Sutphen, ... 963 Broad St., ... Newark, N. J.
Dr. J. O. Tansley, ... 28 West 43d St., ... New York, N. Y.
Dr. Samuel Theobald, . . 304 West Monument St., Baltimore, Md.
Dr. William Thomson, . . 1426 Walnut St., ... Philadelphia, Pa.
Dr. Charles A. Todd, . . . 2645 Washington Ave., . St. Louis, Mo.
Dr. J. Vanduyn, ... 111 South Salina St., . . Syracuse, N. Y.
Dr. J. J. B. Vermyne, . . . 2 Orchard St., ... New Bedford, Mass.
Dr. David Webster, ... 266 Madison Ave., . . . New York, N. Y.
Dr. F. M. Wilson, ... 317 State St., ... Bridgeport, Conn.

American Otological Society.

The Twenty-Second Annual Meeting of the American Otological Society was held at the Pequot House, New London, Conn., on Tuesday, July 16, 1889, at 10 A. M., the President, Dr. J. S. Prout, of Brooklyn, N. Y., in the chair.

The following members were present:

Drs. Joseph A. Andrews,	New York, N. Y.
Gorham Bacon,	New York, N. Y.
W. H. Carmalt,	New Haven, Conn.
J. B. Emerson,	New York, N. Y.
B. E. Fryer,	Kansas City, Mo.
John Green,	St. Louis, Mo.
Emil Gruening,	New York, N. Y.
E. E. Holt,	Portland, Me.
Charles J. Kipp,	Newark, N. J.
Herman Knapp,	New York, N. Y.
J. A. Lippincott,	Pittsburg, Pa.
Arthur Mathewson,	Brooklyn, N. Y.
H. G. Miller,	Providence, R. I.
J. F. Noyes,	Detroit, Mich.
O. D. Pomeroy,	New York, N. Y.
J. S. Prout,	Brooklyn, N. Y.
B. Alexander Randall,	Philadelphia, Pa.
R. A. Reeve,	Toronto, Canada.
S. O. Richey,	Washington, D. C.
S. D. Risley,	Philadelphia, Pa.
J. D. Rushmore,	Brooklyn, N. Y.
W. W. Seely,	Cincinnati, O.
S. B. St. John,	Hartford, Conn.

T. Y. Sutphen, ... Newark, N. J.
J. O. Tansley, ... New York, N. Y.
Samuel Theobald, ... Baltimore, Md.
J. J. B. Vermyne, ... New Bedford, Mass.
David Webster, ... New York, N. Y.
F. M. Wilson, ... Bridgeport, Conn.

And by invitation:

Drs. C. S. Bull, ... New York, N. Y.
E. Fridenberg, ... New York, N. Y.
J. B. Shapleigh, ... St. Louis, Mo.

In opening the session the President referred to the death of Dr. E. Williams, of Cincinnati, O., one of the founders of the Society, who resigned his membership at the last Annual Meeting on account of ill health, had then been elected to honorary membership, and had since died. He suggested that the Business Committee might unite upon one or more names to prepare an obituary notice of Dr. Williams for insertion in the Transactions of the Society.

The President appointed as the Business Committee Drs. C. J. Kipp, H. G. Miller, and W. W. Seely, and on the Committee on Membership Drs. S. Theobald and S. D. Risley, as substitutes for Drs. D. B. St. John Roosa and J. Orne Green, both absent.

The Treasurer's Report was read and referred to Dr. S. D. Risley as Auditing Committee.

The reading of papers was then commenced.

1. Dr. B. Alexander Randall, of Philadelphia, Pa. Inflammation of the Tympanic Attic and Perforation in Shrapnell's Membrane.

Discussed by Drs. Risley, Tansley, Pomeroy, Richey, Bacon, Kipp, Andrews, and Knapp.

2. Dr. F. M. Wilson, of Bridgeport, Conn. Three Deaths following Suppurative Otitis with Two Autopsies. Also A New Mastoid Drill.

Discussed by Drs. Pomeroy, Knapp, Fryer, Tansley, Randall, Richey, Bacon, Kipp, Risley, Andrews, Mathewson, Theobald, Fridenberg, Sutphen, and Reeve.

3. The next paper was by Dr. E. E. Holt, of Portland, Me. Complete Closure of Both External Auditory Canals by Bone in a Patient having Good Hearing Power, with a Previous History of Chronic Suppurative Otitis Media.

It was discussed by Drs. Theobald, Randall, and Pomeroy.

4. Dr. Holt also read the paper entitled: Otitis Media Catarrhalis Acuta, accompanied by Paralysis and Impairment of the Accommodation of the Eye of the Affected Side.

5. Dr. S. O. Richey, of Washington, D. C., read the next paper, on the Functions of the Intra-Tympanic Muscles, which was discussed by Drs. Pomeroy, Bacon, Risley, J. F. Noyes, Randall, Andrews, and Tansley.

At 1 P. M. on recommendation of the Business Committee the Society adjourned till 8 P. M.

Evening Session.

The Society was called to order by the President at 8 P. M.

The records of the morning session were read and approved.

The reading of papers was then continued in the following order:

6. Dr. Gorham Bacon, of New York, N. Y., exhibited a number of photographs of pathological conditions of the ear.

7. Dr. H. Knapp, of New York, N. Y., read a paper on Cysts of the Auricle.

8. A paper by Dr. Huntington Richards, of New York, N. Y., entitled: Two Noteworthy Cases of Traumatic Rupture of the Membrana Tympani was read by title and referred to the Publishing Committee.

9. Dr. W. H. Carmalt, of New Haven, Conn., reported a Case of Epithelioma of the Internal Ear.

Discussed by Drs. Kipp, Seely, and Webster.

10. Dr. B. Alexander Randall made a communication on Photography and the Projection-Lantern in the Teaching of Otology; also

11. On Supernumerary Auricle and Congenital Aural Fistula.

12. Dr. T. Y. Sutphen, of Newark, N. J., exhibited a mummified pea, removed from the ear of a patient, having been enclosed in the meatus for nineteen years.

In executive session the Auditing Committee reported the accounts of the Treasurer to be correct and properly vouched for and the Treasurer's Report was then accepted.

On recommendation of the Committee on Membership the following were elected to membership of the Society by ballot:

Drs. Harlan P. Allen, ... of Columbus, O.
Ralph W. Seiss, ... of Philadelphia, Pa.
David Harrower, Jr., ... of Worcester, Mass.
Robert Barclay, ... of St. Louis, Mo.
Neil J. Hepburn, ... of New York, N. Y.

On recommendation of the same Committee Dr. N. B. Sizer, of Brooklyn, N. Y., was allowed to resign his membership in the Society.

The Business Committee presented the following nominations for officers for the ensuing year:

President: . . . . . Dr. O. D. Pomeroy.
Vice-President: . . . . . Dr. Gorham Bacon.
Secretary and Treasurer: . . Dr. J. J. B. Vermyne.
Committee on Membership: { Dr. Arthur Mathewson. Dr. S. Theobald. Dr. S. D. Risley.
Committee on Publications: { Dr. J. J. B. Vermyne. Dr. C. J. Blake. Dr. J. Orne Green.
Delegate to Executive Committee of the Second Congress of American Physicians and Surgeons: . . . Dr. W. H. Carmalt.
Alternate: . . . . . Dr. F. B. Loring.

Who were all duly elected on ballot.

The Committee further recommended that the Society hold its next Annual Meeting on the day preceding the Annual Meeting of the American Ophthalmological Society and at the same place.

Further recommended that Dr. S. C. Ayres and W. W. Seely be appointed a Committee to prepare an obituary notice of Dr. E. Williams for insertion in the Transactions and the Committee was thus appointed by the President.

The Secretary was requested to express the thanks of the Society to Dr. Robert Sattler, of Cincinnati, O., for his offer of unmounted photographs or the use of a steel plate of the late Dr. Williams.

Voted to request Dr. Bacon to continue the Alphabetical Index of Otological Literature as hitherto published in the Transactions.

After reading the records of the evening session the Society adjourned at 10 P. M.

Dr. J. J. B. VERMYNE, *Secretary*.

FIG. 1.

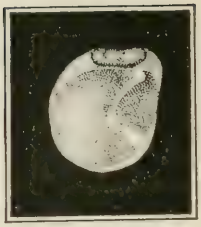


FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

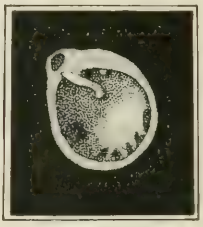


FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

Randall del.

THE PERFORATION IN SHRAPNELL'S MEMBRANE.

By B. Alex. Randall, M. D., *Philadelphia, Pa.*

In spite of a great deal that has been written upon the subject of the inflammation of the "attic" of the tympanum and perforation of Shrapnell's membrane, still further discussion of the subject will be necessary before it receives due attention. Not that the admirable studies of Drs. Green, Blake, Buck, Burnett, Miller, Sexton, and other Americans — not to speak of Morpurgo, Hessler, Politzer, Kretshmann, Walb, and others — have left much for later students to add in the matter; but because these writings are not always readily accessible, and their results remain unknown to not a few of those doing considerable work in otology. The importance of this special field of study must be frequently reiterated, therefore, in order that a knowledge of it may be brought home to the body of the profession; and to that end I beg leave to bring forward some cases as a small contribution to the literature and an endeavor to secure a slight widening of the too narrow circle of those who appreciate the nature of these affections.

There is little that I can add to what has been already put upon record; but my special purpose is to lay stress upon the point that perforation in Shrapnell's membrane is far from infrequent, and to claim that constant vigilance in this direction will bring to light an unexpectedly large number of cases, and in so doing will clear up not a few instances of difficult diagnosis and of exasperating and enigmatical obstinacy. This point of their frequency was brought specially to my mind by a conversation with Prof.

Urban Pritchard as to the "foramen Rivinii," in which he is a believer; and also by the valuable paper by Prof. Charles H. Burnett in last year's Transactions. The latter would indicate a decided rarity of the condition in question in Dr. Burnett's experience, since he cites but twenty cases noted up to that time; and while far from intending to imply that he or others have been overlooking cases (as I know that I have), I wish to record a brief and perhaps exceptional experience in looking for these perforations of late. Surprised that they should be looked upon as rarities, I turned to my records for statistics, only to find the notes too often incomplete to furnish me much aid. So about the first of the year I began to make notes of these cases as I met them in private and hospital practice, with the result of finding my previous impression quite well borne out. Ten new cases presented themselves in the first four months, while two old cases were seen where the perforation at the upper pole, which had been forgotten or overlooked, reasserted itself and began to discharge. Both of these latter had quite complete destruction of the membrana vibrans, — in one case closed by a relaxed and collapsing cicatrix, in the other open and occasionally relapsing into a renewed suppuration. But three new cases have been seen in the last two months, making thirteen new cases among the five hundred seen in the half year, while the addition of five cases from my limited private practice gives me a series of twenty cases noted and sketched. Yet it can be confidently stated that at least as many cases had been previously recognized and treated in my hospital practice where the notes, entrusted to other hands, have been too imperfect even to repay overhauling.

It may not unfairly be urged that such findings are accidental and exceptional, especially when one month furnished four new and two renewed cases; yet I believe that just as Moos[1] found five instances among 126 perforated drum-

[1] Klinik der Ohrenkrankheiten, p. 126.

membranes (apparently three persons among seventy-five) a scrupulous search of this situation in every case will bring a large proportion to light. Thus among eighty preparations of Politzer's in the Mütter Museum, more than half normal, four, at least, show the lesion in question. In a recent paper, Walb[1] cites twenty cases among the 1231 patients seen in one year at the Bonn clinic, and Bezold[2] notes forty cases among the 4427 of three years' practice, and forty-eight among the 3800 of the previous triennium; while Hessler reported ten from his private practice during a few years. One further point in this connection. I have noted only those cases where a *discharging* perforation was present in the flaccid membrane, taking no account in this connection of the numerous dry "foramina Rivinii," nor of the unmistakable cicatrices occasionally met. As to these I will speak presently. In twelve of the cases the perforation was in Shrapnell's membrane alone, — in six there was another perforation, generally extensive, — while in two the lower perforation had cicatrized when the upper was first seen to discharge. The age of the subjects varied from 3 to 55 years: six were under 10 years; four under 20; seven were 30 or under; two were 40; and one 55. In seven cases the right ear was involved, in ten the left, and in three both ears.

The clinical histories of these twenty cases may be stated as follows: —

Case I. — Willie E., aged 6, came January 4th with a suppurating right ear and a polyp filling the meatus. The removal of this was not complete at first, owing to the unruliness of the patient, and several repetitions were necessary before the extirpation approached completeness. A perforation could then be seen above the short process, through the posterior part of which the polyp protruded (Fig. 1). Its seat seemed to be the neck of the malleus,

[1] Archiv für Ohrenheilkunde Bd. 26.

[2] Ibidem Bd. 25, p. 206.

where a rough bare point could be touched by the probe. Suppuration ceased after about five weeks of cleansing and boric insufflation. A few weeks later the other drum-membrane, previously apparently normal except for slight retraction, suffered a similar perforation in the flaccid membrane, which speedily yielded to treatment. The right ear, first affected, has had two relapses within the six months he has been under observation; but is now dry, with no bare bone within reach and with retention of fair hearing. Tonsils and pharynx still in bad condition. There has been no perforation of the pars vibrans on either side.

Case II. — Katie G., aged 14, was referred to me by a colleague on January 11th. An abundant foul discharge filled the left meatus, and, on cleansing, the drumhead was found intact except above the short process, where the whole central portion of the flaccid membrane was gone and the opening filled with flabby granulations. A probe detected bare bone upon the Rivinian margin, and this has felt at times like a movable scale of bare bone. The condition has altered little under too infrequent treatments, but the area of bare bone is tiny and the discharge slight. Recently, after a fortnight's absence, a large reddish polyp had formed, but it has not recurred since removal and cauterization. Right ear normal.

Case III. — Eugenie B., aged 17, came to the Polyclinic in January with a purulent discharge of several years' duration on the left. After cleansing, a small perforation was found at the extreme upper anterior edge of Shrapnell's membrane and bare bone could be felt above by a probe passed into it. Treatment has thus far accomplished little. Fig. 3 would fairly represent this and the preceding case.

Case IV. — Louisa O'B., aged 55, was seen at the Polyclinic in February with a suppurating right ear; and a perforation back of the short process, filled with pale polypoid granulations, was found to occupy most of the posterior

portion of the flaccid membrane (Fig. 2). The growths were bitten off with the forceps as thoroughly as possible, and their remains cauterized with chromic acid; but their vitality was not entirely destroyed, nor the discharge checked, when she ceased attendance after a week or more of treatment.

Case V.—John McD., aged 25, came to the Polyclinic in February complaining of tinnitus and dizziness. Inspection showed a brownish mass above the short process, which was removed with some difficulty. It proved to be a spherical cholesteatomatous mass which had been filling a perforation (Fig. 3); and bare bone could be touched with the probe on the neck of the malleus beneath it. The nares and pharynx were out of condition and the Eustachian tubes imperfectly patulous. The trouble lessened rapidly, more apparently from the inflations, etc., than from the removal of the adherent mass. The denuded surface was merely moist without actual discharge. He disappeared after a week or more of treatment, hearing well and greatly relieved.

Case VI.—Emily B., aged 12, who had long been an occasional attendant at the Children's Hospital, principally for phlyctenular keratitis, returned April 6th with trouble with her left ear. Both drum-membranes had long since been largely destroyed and replaced by thin collapsing cicatrices (Figs. 4 and 5), which bellied out with a painful flap on inflation. Hearing was so much improved by this that I had endeavored to maintain the improved position of the relapsed tissues by painting with collodion some months before, with marked success in maintaining good hearing. The treatment was followed, however, by an inflammatory attack a few weeks later, when a thin yellowish cast of the entire fundus was found and removed, and a brief otorrhœa ensued. An early drawing of the condition shows a perforation in Shrapnell's membrane, but this was forgotten

and its presence overlooked at this time; so the attack was regarded as somewhat enigmatical, but ascribed to the collodion-painting. On her recent visit a new pellicle of yellowish discharge was found covering the fundus on the left, and on its removal the perforation above the short process was seen to be the source of the discharge, which promptly ceased under simple measures, the hearing remaining as good as before. Examination of the right ear, where the destruction and replacement of the vibrating membrane had been quite complete, showed a perforation in the posterior part of Shrapnell's membrane through which the lower part of the malleo-incudal articulation was visible, apparently covered, since all discharge has ceased, by a thin adherent cicatrix. The hearing on this side is very defective and but little improved by the distension of the lower cicatrix. The child has always been very timid, and thorough cleansing and study has always been rather difficult and unsatisfactory, having once or twice been wholly interrupted by fainting.

Case VII. — Eugene D., aged 9, who had been treated for recurrent attacks of suppuration of the middle ear for the past two or three years at the Children's Hospital, returned on April 15th with renewed discharge on the left, part of which was found to come from an opening above the short process. There has always been since first seen a total destruction of the vibrating membrane on each side, and the right ear was figured as an instance of this in Buck's Handbook, Fig. 4199. The left ear presents the appearance shown in Fig. 8. Improvement was prompt under treatment, as it has usually been with him when he can be induced to refrain for a time from diving and indulging in other amusements eminently fitted to excite or maintain inflammation in his unprotected tympanic cavities.

Case VIII. — John C., aged 12, was first seen on April 2d, at the Episcopal Hospital, with a profuse otorrhœa and

complete destruction of the tympanic membrane. From the time that the remaining landmarks have become visible, I have been trying to solve the question as to the nature of a strong smooth ridge of bony hardness, which can be seen between the upper anterior rim of the drumhead and the opening of the Eustachian tube. The ossicles seem lost, and the fixity of the object speaks against its being the remains of one of them. Up and forward, in the meatus wall rather than in the flaccid membrane, is a dry open perforation into the attic (Fig. 6). The hearing remains very defective and the stapes cannot be seen or felt.

Case IV. — Alice B., aged 3, has been enlivening the clinic at the Episcopal Hospital since April 10th with deafening and unremitting shrieks during the entire time of her presence. She was brought with a polyp entirely filling the left meatus, and its removal was long too incomplete to control recurrence. Dead bone was felt at several points, partly covered by granulations; but the bleeding, combined with the incessant struggles of the child, have rendered thorough study and treatment nearly impossible. A perforation above the short process was seen at the second visit, and the malleus was evidently dislocated (Fig. 7); but efforts to remove it without violence failed till the 24th, when the manubrium, slightly eroded, came away readily: the head of the ossicle has not been seen. Almost the entire vibrating membrane has been absent from the first and the polyp has seemed to arise near the opening of the Eustachian tube. A bridge of tissue still separates the lower from the upper perforation.

Case V. — Mr. Smith F., aged 40, was sent by a medical friend with a question as to the presence of dead bone. An otorrhœa of some ten years' duration had been checked a few months before, a polyp, and later a very adherent crust, removed, and a great improvement in hearing obtained. Some sense of fullness had returned and he came

because of dizziness, etc. A dry oval perforation was seen in front of the manubrium, a depressed cicatrix above the short process, and on removal of a hard and very adherent crust back of the short process a perforation was here found with a moist granulating surface (Fig. 9) within, apparently on the incus shank. No bare bone was discovered, and Politzer inflation dissipated the sense of heaviness which had been present, and the relief has continued.

Case XI. — Ebenezer L., aged 30, an orderly in the Episcopal Hospital, was seen April 23d with a discharge from his right ear and a polyp growing from above the short process (as in Fig. 1). The attack was the recurrence of an old trouble. Removal of the polyp showed an opening above and in front of the short process with caries of the Rivinian margin. Under cleansing, etc., the discharge and granulation have been almost controlled, the opening is generally covered by a tough film, and little bone is bare. There has been a decided loss of the bony margin, but the perforation remains unchanged. The polyp rose from the neck of the malleus, but this point now seems healed. The left ear shows an opening in corresponding position, with scanty discharge, but with bare areas on the exposed head and neck of the malleus.

Case XII. — Gertrude R., aged 5, was seen about the last of April suffering with an acute first attack of otitis media on the left, the sequel of a choriza. The muco-purulent discharge was coming from a small pouting perforation above the short process. Healing resulted in a week or ten days under cleansing and boric insufflations.

Case XIII. — Lawrence O'N., aged 23, came to the Polyclinic on June 29th with an old suppuration on the right side and a polyp arising from near the short process. On removal, an opening was found in the flaccid membrane anteriorly and an oval perforation nearly over the stapes.

Case XIV. — Mr. B. F. H., aged 25, was seen May 22d with an acute suppuration of both ears. History of a fleeting attack after swimming, as a boy. On the right the meatus was full of very foul pus and epithelial flakes: no air passed on inflation, and granulations above the short process were the apparent source of the discharge, marking the seat of perforation. The rest of the membrane was intact. On the left there was a small perforation with granulating margins below the short process. Two days later the perforations were not visible but air passed through dry on inflation. No further trouble.

Case XV. — Abbott C., aged 27, was seen about the first of July with an acute suppuration on the left, and examination shows a perforation in the engorged flaccid membrane. He is still under treatment.

Four previous cases are recorded and sketched in my private case book.

Case XVI. — Mrs. Clara N., aged 25, came under observation in August, 1886, with a history of post-scarlatinal otorrhœa of both ears which had left the hearing much impaired and variable. There was much naso-pharyngeal trouble, with extremely nasal voice. The right membrane was intact with two thin manometric areas anteriorly, doubtless cicatricial. Improvement followed inflations and treatment of the nares. A month later after severe general cold-taking she returned with a discharge from the right ear, and a small perforation with a pinshead granulation on its posterior lip was found above the short process. Air passed by Politzer inflation. The discharge soon became barely enough to form a crust over the perforated area, and when this crust was last removed in January, 1887, there was no discoverable excoriation or perforation. It may be noted that on the left the meatus ended in a blind rounded extremity at half the usual depth, which gave firm bony resistance to the probe and also to the needle at all

points. The hearing was questionable even by bone conduction.

Case XVII. — Isabella McC., aged 40, was sent by a medical friend who had been treating for several weeks a suppuration of the right ear of four months' duration. Two swollen areas on the meatus walls largely concealed the bottom of the meatus, and one of them, near the upper pole of the membrane, was at the mouth of a sinus which could be entered to a depth of several lines. The presence of a bone lesion was not established. Two days later these swellings had been dissipated, showing a considerable polyp arising in the region of the short process. Its removal showed the drumhead intact except at the upper anterior margin, where a tiny opening seemed the point of origin of the polyp. Healing was prompt, with good hearing and no open perforation.

Case XVIII. — Mrs. Anthony Q., aged 30, was seen in consultation in February, 1888, suffering with a recurrent attack of otorrhœa on the left. There was a large reniform perforation down and back, and a polyp arising at the upper pole seemed on removal to have come through a small cleft-like opening above the short process (Fig. 11). There was prompt cessation of the discharge with some improvement of hearing. Three months later renewed deafness was relieved by removal of a mass of inspissated discharge closing the lower perforation. No trace of an opening above.

Case XIX. — John B. K., aged 5, was seen in March, 1888, with a small perforation at the extreme upper margin of the right membrane from which discharge had been nearly continuous for the eighteen months since he was knocked down and tumbled about badly by a breaker at the seashore. "Grains of sand" had been noted at times in the thin, foul discharge and were supposed to be relics of his beach discomfiture, but were doubtless necrotic parti-

cles from the Rivinian margin. The child was very unmanageable and probing practicably impossible. The air passed at times by Politzer inflation; but some diminution in the quantity and fœtor of the discharge with an occasional apparent intermission of the discharge was all that had been effected when he ceased treatment. The sketches of this and the preceding case were published in Buck's Reference Handbook (Figs. 4180 and 4207).

Case XX. — A girl of nine years, name not noted on the sketch made, was under treatment at the Episcopal Hospital for several weeks in 1887, with an obstinate long-continued discharge from a large perforation at the upper margin of the tympanic membrane over the malleo-incudal articulation. A polyp had protruded through the opening and had been partly removed; but the remainder could only be seen when pressed up from below, and all efforts to seize it failed. There were bare areas of bone on both of the uncovered ossicles and apparently in the attic also. No one came with her to give consent to any more radical measure of treatment, and when told to bring one of her parents she ceased attendance. The condition is shown in Fig. 10.

An interesting case of the same kind was recently seen through the courtesy of Dr. Risley, where the large loss of substance entirely uncovered the head of the malleus, and the attic seemed lined by a greenish, slightly discharging membrane, as indicated in the sketch (Fig. 12). Polypoid granulations had filled the area; and a mass of tissue remaining on the neck of the malleus looked like a duplicated short process.

In a recent paper Walb[1] of Bonn, who has evidently been a careful student of this matter and with quite wide experience, since he cites twenty cases among the 1231 patients seen in the year at his clinic, discusses the causa-

[1] Walb, Arch. f. Ohrenheilkunde XXV.

tion of the condition and follows v. Troeltsch in assigning an important role in the matter to the foramen of Rivinius: holding the view, however, that the inflammation is an infection gaining entrance to Prussak's pouch and the attic from without. V. Troeltsch[1] thought that the foramen or its thin site predisposed this point to rupture earlier than any other part of the membrane.

Is it not time that we reached a better understanding as to this foramen Rivinii? Is not its existence as a physiological condition a chimera based upon a wholly erroneous view as to the development of the auditory apparatus? All modern embryologists, among the latest of whom I may cite my friend, Prof. Piersol[2] of Philadelphia, agree that the external meatus is a pouch extending inward from the cutaneous surface, and the Eustachian tube, tympanum, and antrum, a pouch extending outward from the pharynx; and that these two distinct cavities never unite. A partition remains intact always between them, and this partition differentiates into the membrana propria and the ossicles. Of course it is the case that in the flaccid membrane there is hardly a trace left of this mesoblastic partition: that the cutaneous and mucous structures come into practical contact: yet all assumption of the existence at any stage, of a colobomatous gap which must be closed by the normal development, but may remain open through incomplete advance of this process, is totally unfounded. Rudinger[3] in one of his latest studies says that his unbroken series of mammalian and fœtal heads shows no single instance of the condition in question. Schwartze is equally emphatic: "A normal foramen Rivinii does not exist."

But, it is argued, the foramen is a clinical fact; it is not infrequently seen, and on both sides symmetrically,

[1] Troeltsch, Lehrbuch, VII. Aufl. s. 39.

[2] Piersol, Zeitsch. f. wiss. Zoologie XLVII.

[3] Zeits. f. Otol.

in cases where pathological process can be excluded. To this I take absolute exception. The occurrence of *post-natal* disease of the ears can not be excluded in one case in ten — not to speak of pre-natal lesions. I will venture to assert that a considerable percentage of the children of the members of this Society will, on rigid examination, show evidence of tympanic disease which may have escaped the attention of their aurist fathers. Investigate, before you scoff at the idea. I constantly see children whose delicate health has caused them to be watched from early infancy with the utmost care by intelligent guardians, where in spite of open perforations, unmistakable cicatrices, huge chalk deposits, or other gross lesions, all history of earache or otorrhœa is emphatically denied. That we meet this daily in the unobservant is natural enough; and it is largely among these in our clinics that we see these foramina. I have at hand the notes of only eight cases of foramen during the last six months, five of them bilateral; but these were not more than half of those that I met. Numbers of other cases, showing an apparent scar in this locality were met, but are not counted in this connection. Walb noted twenty-eight cases among his 1231 patients, — fifteen bilateral. Those who search for it in the cadaver, like Bochdalek, find it at times only with the aid of a lens. To this form, clinically invisible, I make of course no reference. Yet there can be no real question that the foramen is normally absent, common as it is; its presence is an anomaly that lacks all physiological explanation, yet is easily understood as a pathological lesion. Many authors have called attention to the frequency of a perforation at this point in the fleeting catarrhal otitis of children, and where is the child that has not screamed a night through with earache? A heavy burden of proof will rest on any one who endeavors to present such a happy creature. Such cases with a clear history of choriza and evidence that the

inflammation has extended from the nasal cavities, will not infrequently show early in the attack a bulging above the short process. Fail to secure resolution, and the case will run on to perforation; but with the discharge of mucus, serum, or pus, perhaps in very small amount, healing will ensue — with or without a permanent opening in Shrapnell's membrane.

As to the localization of the perforation at this point much has been written, yet without wholly clearing up the matter. It is quite certain that there is a pouch or series of cavities at this point more or less corresponding to Prussak's "third pouch" — that this area is generally somewhat cut off by the ligaments of the ossicles and other septa from communication with the rest of the tympanic cavity, and on the onset of any inflammatory swelling may be wholly shut off. Under such circumstances drainage will be impossible; and while the rest of the drum cavity could discharge its abnormal secretion through the normal outlet of the Eustachian tube and the case thus pass on to resolution so far as the atrium is concerned, a very different result is to be expected for the upper collection. Morpurgo's case where puncture of an unaffected flaccid membrane permitted the passage of air at first, and also later, but where no transmission was obtainable when the engorged flaccid membrane was incised, gives valuable evidence on this point; and would probably be confirmed in many cases by any one repeating the experiment. The various bands and membranes of the attic doubtless present many individual variations which have great influence in determining such an occurrence as we are now considering. Here, it seems to me, the matter may be left; ascribing to the individual anomalous development of septa within the attic, which readily serve to localize inflammatory processes, the causation of the foramen of Rivinius as a pathological perforation: then we are ready to listen to v.

Troeltsch's view that this open or weak point is a likely origin for a future discharge, or to that of Walb that here entrance is found for infection from without. But it is time that the exploded theory of Huschke as to the development of the tympanic membrane was laid to rest, and that the foramen of Rivinius should be regarded merely as an unclosed perforation.

One valuable practical result may confidently be expected from the adoption of this view, — this region will be more carefully studied, with careful cleansing away of everything which obstructs the view, in all cases that present themselves: and early recognition and judicious treatment of the acute cases will leave us a smaller heritage of the chronic, obstinate, and dangerous class of cases, which make the fistulous opening at the upper pole of the tympanic membrane a bugbear to the aural surgeon.

DISCUSSION.

Dr. Miller: — I do not know that I have anything special to add, except to agree in regard to the relative frequency of the condition. It seems to me that since my attention has been called to it, I have continued to observe it more frequently than most authorities would lead us to suppose that it existed.

Dr. Risley: — There is one point to which I should like to refer and that is the frequent association of perforations in Shrapnell's membrane with perforations elsewhere in the membrane. The presence of perforations in other parts of the drum-membrane does not exclude its presence in Shrapnell's membrane. I have seen this frequently, although I believe that its existence has been denied.

Dr. Tansley: — I meet these cases both in the clinic and in private practice, and occasionally I get perforation of that part of the membrane of which the doctor speaks

and at the same time perforations in other parts, but these double perforations occur very rarely indeed.

I find this swollen condition of the flaccid membrane showing inflammation of the attic, and think it the most common form of acute otitis that we meet. A singular thing to me is the fact that we seldom can get the perforation whistle even in acute cases, after an opening has been made with the knife, or in the chronic cases which have already perforated.

If I see these cases early, by perforating the flaccid membrane I get good results, and often when I do so the knife hits against what seems to be dead bone, and I imagine I am going to have a necrosis, but it does not occur.

One class of these cases to which my attention has been especially called, because I have seen them in consultation with very skillful gentlemen: I allude to those cases where the membrana flaccida is greatly swollen and is bulging out into and down upon the floor of the canal and having a small perforation in the apex. I term them "tent-shaped perforation of the flaccid membrame." I remember one case in particular at the Manhattan Eye and Ear Hospital, in which it was said that there was a polypus filling the canal, and where there had been several attempts made to remove it by means of forceps. Upon examination I found it to be a badly swollen condition of the flaccid membrane, which dropped down, almost filling the external canal, and in its apex was a small necrotic perforation.

I always tell my assistants that if in these cases they try to remove this seeming tumor they will do great harm. The treatment which I adopt is to slit them directly through and then treat them expectantly.

I do not make much effort or continue long in trying to get a perforation whistle in these cases.

Dr. Pomeroy: — I would ask Dr. Randall how he explains the frequent failure to get the perforation whistle. I

have offered several explanations, none of which are entirely satisfactory to myself. I should be glad to hear his opinion.

DR. RANDALL: — This matter has been so much better studied by others that I have very little to add to what has been said. These pouches, which sometimes assume the form described by Prussak and sometimes that described by Politzer, are often very nearly shut off from the lower part of the tympanic cavity, so that a very little swelling is sufficient to prevent both the discharge of pus and the access of air.

DR. RICHEY: — My observation of the frequency of perforation of Shrapnell's membrane does not exactly correspond with that of Dr. Randall. I do not see it so often. I find perforations in this locality more difficult to manage than elsewhere. They rarely cicatrize.

My observations in regard to the absence of perforation whistle corresponds with that of the other gentlemen. I have attributed it to the same condition as has Dr. Randall.

I have had cases in which there was perforation in other parts of the membrane which have healed, still leaving the perforation in Sharpnell's membrane. My treatment in these cases besides the local measures through the external auditory meatus has been injections through the catheter of a solution which, I think, is not used by others. It consists of one part of nitrate of silver, ten parts of boric acid, twenty parts of glycerine, and five hundred of water. We thus have a germicide, detergent, disinfectant, and astringent. I find that this has more influence upon suppuration of the tympanic cavity than almost anything else that I have used.

In the discussion of Dr. Burnett's paper at the meeting of the Congress last year I referred to the case of a child whom I had treated for a long time in which this condition had occurred. There was a perforation of the drum-mem-

brane anterior and below. I succeeded in healing that, but the suppuration from the tympanic cavity continued for a long time. I treated it with iodoform and nitrate of silver 1 to 5. I succeeded in controlling it and there had been no recurrence of suppuration for two years. Dr. Burnett said that I might have it even at the end of five years. This winter the patient began to menstruate and with menstruation suppuration again occurred. These cases are difficult to handle. We occasionally secure some kind of cicatrization. I find that in the majority of these cases there is profuse granulation excited by, I think, the peculiarly irritating quality of the pus in the auditory meatus itself. I have removed such granulations week after week and still they would crop out if the pus were allowed to remain even for a day, thus showing its irritating character.

Dr. Bacon: — I agree with the last speaker in regard to the frequency of this condition. I have not observed it as often as the reader of the paper. I think that it is not discovered as frequently as it should be, because it is difficult to detect it in many instances. It is usually associated with carious bone. In the treatment of this class of cases I have generally used Blake's intra-tympanic syringe and have found that by persistent syringing out of this cavity with antiseptic solutions, and by the use of astringents, you could frequently heal the perforation. These cases are, however, as a rule, very tedious.

Dr. Pomeroy: — I would ask Dr. Richey how he expects to reach this portion of the tympanic cavity through the catheter, when it is admitted that the production of the perforation whistle is so infrequent? If you cannot force air through, how can you force fluid through? It seems to me inconceivable how this can succeed, except in the cases where you secure the perforation whistle. I should like to hear him explain how he gets the application to the attic of the tympanum under such circumstances.

Dr. Richey : — "There are more things in heaven and earth than are dreamed of in our philosophy." I am not able to explain how the fluid acts under these circumstances. I think that we often cure the suppuration without reaching the cavity. I feel sure, moreover, that solutions can not be passed through the ear. But that I get a good effect from this treatment I know by experience. I also treat these cases from the outside.

Dr. Andrews : — In connection with this subject I wish to show a couple of instruments made by Mr. Ford, of Hazard, Hazard & Co., N. Y., which have been serviceable to me for a number of years. I have used them in the treatment of a patient with purulent inflammation of the attic with a large hole in Shrapnell's membrane, which I think could not have been treated by any other means. I use two tubes, one for injecting, the other for withdrawing fluid from the tympanum. I use a saturated solution of boric acid. After thoroughly washing the tympanum through one tube, I thoroughly withdraw the fluid which remains with the other tube. I then dry the parts with cotton wrapped around a fine probe, such as that devised by Dr. A. H. Buck. The case just referred to is that of a gentleman, seventy-three years of age, who has had a purulent discharge from the ear for forty years. Winter before last, while in Florida, he had a little uneasiness in the ear and on that account came to see me on his return to New York. I found a large hole in Sharpnell's membrane. Passing a a probe through this opening, I found rough bone in one place. The discharge was not at all offensive. I treated it daily for three months. After injecting the cavity with a warm saturated solution of boracic acid and then thoroughly drying it, I blew in a faint cloud of boric acid. By this means the discharge had entirely ceased at the end of two and a half months. I then dismissed him, but three months later I saw him again. There was then a mucous dis-

charge from the ear, but it was not purulent nor has it become purulent since. He is subject to gout, and an attack of gout seemed to have given rise to the uneasiness in the ear which led him to consult me. I saw the patient three weeks ago and the ear appeared to be perfectly well. The hole in Shrapnell's membrane has not closed.

Dr. Knapp: — I wish to make one remark with reference to the capital difference between the upper and the lower part of the tympanic cavity. In the lower part we sometimes get closure of a perforation in three or four days. In the upper part I have never seen that: the perforation continues for months and years. This is due, I think, to differences in anatomical structure. In the lower part we have little complication with periosteum. The tissue here is a specific tissue like the cornea. The upper part is, however, a duplicature of periosteum and skin and, when affected, the process extends to the periosteum, and caries and necrosis of the bone occur. In the treatment of these cases the parts must be kept clean. If there is caries the bone must be scraped, and if there is a small sequestrum it should be removed. I think that it is possible to attack these cases through the mastoid process. There is certainly here a large field for work, and good and clean work, of which we now know only the beginning.

Dr. Kipp: — The treatment of this condition through a perforation in the mastoid has been suggested by Schwartze, but all that you can do by this method is to wash out and drain the cavities.

Dr. Knapp: — These affections of the ear involve neighboring pneumatic cavities. Cheesy masses may be located in the mastoid, which are at the bottom of these relapses. In chronic cases I think that this is the cause of the obstinacy and of the recurrences of the disease. If you want to get at that, I do not see any safer way than attacking it behind. The fact that this has been done before is no reason why it should not be done again and done better.

Dr. Tansley : — Since our meeting here last year, when we had before us the question of removing the ossicles for chronic attic trouble, I have paid especial attention to this class of cases, and in my private work and at my clinic at the Manhattan Eye and Ear Hospital, I have had but three bad chronic attic cases. Each one I have cured and they have remained so up to the present time.

I have seen no indication for the removal of the ossicles and certainly not for opening the mastoid : this latter procedure would, I fear, make a bad matter worse.

I have used in these cases only the intra-tympanic syringe with various and varying solutions, as hydrarg. bichloride, acid. boric, sod. bicarbon., and peroxyde of hydrogen (the latter giving me the best results), and after cleansing have used arg. nitr. solutions, injected or applied on cotton probe.

I should say, upon a rough estimate, that fifty per cent. of the acute cases arise from inflammation in the attic, and if seen sufficiently early a cure can be effected in a week or less by perforating the flaccid membrane and making applications to the naso-pharynx. You all know my views of the relation between the pharynx and the ear. By the use of exosmotic treatment or applications to the naso-pharynx, I get the same result that is claimed for the catheter ; the use of which instrument, permit me to say, I am greatly opposed to.

Dr. Randall : — Had I read the notes of my cases in their entirety, it would have been seen that several of them were of the type to which Dr. Tansley has referred. One, in particular, was an ordinary case of acute otitis media of childhood in a child five years of age. The perforation in Shrapnell's membrane was unmistakably seen. I have seen cases in which I ascribed the pus to this, but the perforation was not seen. I have omitted all such cases.

In treating these cases I have employed thorough cleans-

ing with the intra-tympanic syringe with peroxyde of hydrogen, followed by cotton on the carrier designed by Dr. Harrison Allen, and finally the use of powdered boric acid. I have also used the catheter and I think that there is no question that we can do a great deal by treatment through the Eustachian tube, in doing away with the obstruction which exists in cases of inflammation, attacking the swollen tissues on the tympanic side.

I have seen these cases in which there were one, two, or three perforations in the lower part of the membrane, and some in which there was entire destruction. I have never removed the ossicles. I did not enter into the matter of treatment, as I thought that this had been dealt with by those who had had a wider experience than I.

I wish to lay stress upon the point that in a large number of cases the acute otitis of children is located more or less distinctly in this region; that it gives rise to the foramen of Rivinius and that this is very frequently present as a point of least resistance and may be the entrance point of infection from without.

The odor has been spoken of. In some cases where there was absence of dead bone, there was a peculiar alkaline pungency to the discharge which made me search closely for such a perforation. These cases often do not discharge a creamy pus, but a yellowish, rather sanguinolent fluid with a tendency to dry in leathery scales which sometimes come away as a cast of the drumhead and meatus wall. The drumhead may appear entirely clean and normal, with only a slight crust reaching to it along the upper or anterior wall; and only on the removal of this crust will it be seen that the material has exuded at the upper pole. Drainage is difficult and the discharge may come out only when the patient is lying down — hence the peculiar location of the crusts.

THREE DEATHS FOLLOWING SUPPURATIVE OTITIS, WITH TWO AUTOPSIES. ALSO A NEW MASTOID DRILL.

By Dr. F. M. Wilson, *Bridgeport, Conn.*

Deaths following a first attack of acute suppurative otitis are rare enough, I think, to be put on record. I reported one case in Knapp's Archives, 1885, though the details were very meagre. I have since then seen, in private practice, two more cases, and report them today. A hospital case of Dr. Emerson's, though following old otitis, is also included, partly because the house surgeon's notes of case and autopsy are quite full and complete, and partly because it is a case of abscess of the brain, whereas one of my cases is one of meningitis, and the cases furnish some points of contrast.

Case I. — (In consultation with Dr. Bill.) Louisa H., age 40, March 4, 1888. "About two weeks ago began to have pain in both ears: never had any trouble with her ears before; pain not severe enough to confine her to the house or to keep her awake at night, but on February 27th, six days ago, the pain became severe in left, but there was no cerebral disturbance until March 1st. Then, while alone, she became partially unconscious and has remained so since. The symptoms now are stertorous breathing, contracted and immovable pupils, skin pale and dry, pulse 100, temperature 100° in axilla. Left auditory canal filled with pus, but no history of discharge from that ear. Large perforation left membrana tympani. Right auditory canal filled with wax. No redness, swelling, or tenderness over either mastoid; occasional slight convulsive move-

ments of hands and face. Ophthalmoscope shows no neuritis.

"As a forlorn hope, left mastoid was drilled to the depth of half an inch; no pus. The cartilage of external auditory canal was found separated from the bone posteriorly, and from here a small amount of pus came. Further efforts abandoned, gradual deepening of coma, and death, March, 6, 1 P. M. No autopsy obtainable."

The only value of this case is to help establish the fact, if help is needed, that deaths do occasionally occur from a first attack of acute otitis.

Case II. — L. H. S., age 23, architect. March 11, 1889. Earache since yesterday morning (left ear), mt. red, R. w. $\frac{4}{6}$, L. w. $\frac{5}{6}$. Ordered him to leave business, remain quietly at home. Cotton pad and steam for relief of pain.

March 17, 1889. Have seen him daily since the 11th. He has not been entirely free from pain but has kept the pain bearable by steaming at intervals of from one to three hours; and by taking a teaspoonful of bromidia at night has usually got several hours' sleep. Has been up and dressed every day, but much depressed in spirits and, as it seemed to me, over-anxious about himself. Appearance of mt. has not materially changed. His bowels have been obstinately constipated, but with copious injections they moved today for first time since the 11th.

March 20, 1889. He seems so much better that I discontinue all treatment, but he is to remain at home for a day or two before returning to business.

March 22, 5 A. M. Hurriedly called to him on account of pain referred principally to top of his head.

March 22, 4 P. M. Temperature (mouth) 103°, pulse 76, respiration 17. Seems to understand what is said to him, but his answers are not coherent; is dressed and sitting up. Moves about the room with ease, though slightly dizzy if he moves quickly. No pain in the ear.

Ordered copious injections to free the bowels, absolute rest in bed, cold to the head, and bromidia if necessary.

March 23, 7.30 A. M. Temperature 103½, pulse 79, respiration 22. Is quiet most of the time, occasionally moaning. Will do simple things, like moving in bed, when told to, but when questioned only mumbles inarticulately in reply.

March 23, 8.30 P. M. Temperature 104½, pulse 82, respiration 27. Incontinence of urine during the afternoon.

March 24, 1889, 8 A. M. Temperature 104°, pulse 85, respiration 31. Considerable rigidity of muscles of neck and back. Tremulous motions of hands and arms, less ability to understand.

March 24, 3 P. M. For the first time free perspiration. Temperature 102½, respiration 29, pulse 85. 5 P. M. (in consultation with Dr. Emerson) paracentesis, left mt., a drop or two of pus.

March 25, 1889, 7.30 A. M. Temperature 104, pulse 88, respiration 33.

March 25, 1889, 4.30 P. M. Temperature 104½, pulse 87, respiration 36. 10 P. M. (in consultation with Dr. Emerson) mastoid trephined to depth of three quarters of an inch. No pus.

March 26, 1889, 7.30 A. M. Incontinence of urine continues. Rigidity of muscles of neck and back has increased: will nod his head in answer to questions, but makes no attempt at speech. Temperature 104½, pulse 93, respiration 41. For first time pupils slightly dilated.

March 27, 1889. Death 3 A. M.; autopsy 3.30 P. M. Present, Drs. Cumming, Blodget, and Wilson. The anterior two thirds of the base of the cerebrum was covered with purulent exudation. The purulent process had also extended upward on the superior surface of the frontal convolutions, about two inches. There was about half an ounce of turbid fluid, with a few purulent flocculi in it.

between dura and inner meninges. Dura mater normal. Abundant purulent exudation in the internal auditory meatus. On section with a fine dentist's saw, pus was found in the labyrinth, also in the tympanum.

In this case the subacute otitis at the beginning differed in no respect in its external manifestations from hundreds of cases which get well. The line of bacterial invasion was clearly through the labyrinth and internal auditory meatus.

Case III. — (Notes of House Surgeon, Dr. Walton.) Thomas Ryan, age 10. September 10, 1888. Has had O. M. S. C. (right ear) at intervals for years. Present acute attack began September 5th. Today there is pain, some discharge from tympanum, with mastoid swelling and fluctuation. Treatment — two leeches over mastoid, hot douche, and poultice.

September 11. Etherized, and by Dr. Walton a Wilde's incision made, letting out a large quantity of pus (very offensive). The periosteum is raised from the whole of the mastoid process on its outer surface and the bone is bare. No mastoid fistula was found. The wound was packed with oakum, flaxseed poultice, and bandage applied. Hot douching of T. continued. Temperature yesterday not taken. September 11, today, A. M. $100\frac{3}{5}$, noon $103\frac{2}{5}$, P. M. $103\frac{3}{5}$.

September 12. Wound cleaned and syringed with bichloride solution 1-10000 twice daily, then packed with oakum. Has been restless and peevish, though not complaining of pain. Discharge from wound and T. very slight. Temperature, $101\frac{3}{5}$ A. M., $100\frac{3}{5}$ M., $99\frac{2}{5}$ P. M. Pulse rapid and weak.

September 14. Was awake, restless, and crying the greater part of the night. During the whole of today has slept, was not easily aroused. Bowels moved once during the night after dose pulv. glyc. co. Eats nothing, and it

is difficult to make him take his milk punch. This A. M., ten minutes after taking milk and whiskey, he vomited, the vomiting being expulsive in character. Sleeps constantly and takes no notice of surroundings. Pupils not contracted and respond to light. Temperature, A. M. $97\frac{3}{5}$, M. $99\frac{2}{5}$, P. M. $98\frac{3}{5}$. Pulse 105.

September 15. This A. M. is in a comatose condition, can not be aroused. Swallows a little milk punch when put into his mouth with a spoon. Enema of milk and whiskey given. Very little discharge from wound and tymp. Moans when wound is dressed, at other times shows no signs of pain.

Temp. A. M. 98°, P. 62 and weak : M. $101\frac{1}{2}$, P. 70 strong : 1.30 P. M. $103\frac{4}{5}$, P. 128 : 2.25 P. M., pupils contracted, do not respond to light. Patient sweating freely.

Dr. Pomeroy saw patient in consultation with Dr. Emerson. He advised that the mastoid cells be opened. The patient was taken to the operating room and without an anæsthetic Dr. E. opened the mastoid by a Buck's drill. No pus found. Forcible syringing showed no communication with the tympanic cavity. Patient was in condition of coma and showed no pain. Patient died about 4.30 P. M.

Autopsy. Meninges normal. Surface brain normal, except perhaps an unusual darkness and fullness of the vessels.

As the right hemisphere of the cerebellum rolled out of its fossa it was accompanied and followed by a flow of dark, dirty looking, lumpy, and extremely offensive pus. The right half of hemisphere was soft and friable, somewhat discolored and pale, and in the upper outer angle of the semi-lunar lobe was an opening through which the pus exuded.

Horizontal section of the hemisphere revealed an abscess cavity of two drachms or more, the walls of which were

dark, firm, and somewhat membranous. The periosteum was raised from the outer half of the posterior surface of the petrous portion of temporal bone and also from the adjacent portion of the groove for the lateral sinus forming a pocket that contained about one drachm of pus. This cavity communicated by an opening through the periosteum with the opening leading to the abscess cavity in the cerebellum. The tentorium cerebelli was easily detached from its insertion along the superior margin of the petrous portion of the temporal bone, and also the periosteum covering the outer half of the anterior surface of the petrous portion was easily detached from the bone. The outer half of the petrous portion of bone was necrotic and discolored, and the uncovered portion of the groove for the lateral sinus was in a similar condition. The whole of the outer surface of the mastoid process and a part of the squamous part of the temporal bone had been denuded of periosteum and were dark of color. The cellular structure of the mastoid process, examined through the perforation made by the drill, was discolored, soft, and easily broken down.

Along the whole extent of the posterior and superior walls of the bony portion of the external auditory canal the periosteum was separated from the bone. On the superior posterior aspect of the bony part of the external auditory meatus, about one quarter inch internal to its commencement, was found a fistulous opening leading into the mastoid cells, and communicating with the opening made by the drill. Whether this fistula was the result of necrosis or was made by the probe at the time of the operation is not established.

There was no direct channel of communication leading from the tympanum and mastoid cells to the abscess cavities in the cerebellum and posterior fossa, nor was there any communication of these abscess cavities with the external surface of the mastoid process. The membrana tym-

pani was cicatricial and intact with the exception of a small opening in its upper part. The lateral sinus was opened and carefully examined and no pus detected.

There are a number of contrasts between this case of abscess and Case II. of purulent meningitis.

In the case of meningitis the temperature, the first time it was taken, within eighteen hours of the outset of cerebral symptoms, was 103° F. and it steadily increased to 104½. In the case of abscess, the range of temperature was much lower, the highest point reached being 103⅘, and it was also much more variable, being twice subnormal.

Vomiting was present in the case of abscess but not in that of meningitis.

Rigidity of muscles of neck and back was present in the case of meningitis but not in the case of abscess.

Pupils were contracted in the case of abscess and dilated in the case of meningitis.

There was incontinence of urine in the case of meningitis but not in the case of abscess.

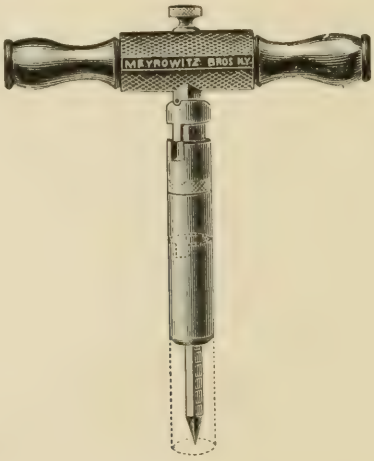
At the autopsy in the case of meningitis there was found a purulent process, starting undoubtedly in the tympanum and extending by bacterial invasion to the soft tissues of the labyrinth and thence along the sheath of the auditory nerve to the brain meninges, leaving the bone, dura mater, and brain substances sound, so far as we could judge by macroscopic examination.

In the case of abscess, the extension from the tympanum seems to have been to the bone, causing first an external mastoid periostitis and then a similar process on the posterior surface of petrous portion of temporal bone, and the accumulated pus pushing its way along the line of least resistance caused the abscess of the cerebellum.

It will also be noticed that in none of the cases was the operation of the slightest benefit, nor did it seem to do appreciable harm.

Lastly, I wish to present a drill which has served me so well during the past two years that I venture to call the attention of the Society of it.

The drilling part is a triangular piece of steel with sharp edges, the point being a three-sided pyramid. A cylindrical guard has a thread cut on its inner side, and by revolving it any desired length of drill can be uncovered. A slide above sets the guard at any desired point. The triangular shape is simple, easily sharpened when dull, and effective. The guard renders the instrument one of abso-



lute precision, i. e., it can not slip, but only penetrates as far as the deliberate choice of the operator allows.

In cases where a fistula has already formed through the mastoid or where the outer table is soft or thin and the cell walls also thin and easily broken down, I do not think there is much choice in instruments, but unfortunately this is not always the case. In a collection of forty-six temporal bones which I have, there is almost every possible combination of air space and bone, and in four of them it would be practically impossible to reach the antrum with any sort

of instrument without injuring the lateral sinus; and in many of the others the danger would be very great.

So far as my own experience goes I have found the drill especially useful in cases where there was more solid bone than air space.

The point is sharp and has no tendency to slide over the surface of the mastoid when it is first revolved. The sharpness also renders the sense of touch more delicate because less muscular force is necessary to drive it, but of course no one is justified in relying wholly or even principally upon the sense of touch, as so much more information can be gained from the sense of sight, and in this connection the use of peroxide of hydrogen, first suggested to me by Dr. Dayton for removing and decolorizing blood during the operation, I consider a very important measure.

DISCUSSION.

Dr. Pomeroy: — I was present at the operation on the second case, that of purulent meningitis. I fancy that the doctor has left out one little point. During the operation, a probe was passed into the opening in the hope of reaching the tympanum. After a time it did enter a cavity which we thought was the tympanic cavity. Not very much force was used. Subsequent examination showed that it had penetrated the thin posterior wall of the meatus near to the drum-membrane but was not in the drum cavity.

Dr. Wilson: — I was not present at the operation and had to depend on the house surgeon's notes. The remarks of Dr. Pomeroy would clear up the point in the notes where it is stated that it was uncertain whether or not the opening had been made by the probe.

Dr. Knapp: — You said that you used the peroxide of hydrogen to decolorize the blood. Does it do so?

Dr. Wilson: — Yes, it does decolorize blood. Its use

for that purpose was first suggested to me by my hospita colleague, Dr. Dayton. The solution which I use I get of Eimer & Amend, New York City. It is sold by them as a twelve per cent. solution.

Dr. Randall: — The imported peroxide of hydrogen is said to contain from twelve to fourteen *volumes* of the gas to one of water. I ordinarily use it diluted with four or five times its volume of water. The labels on the bottles claim that one pint of the solution contains twelve to fourteen *pints* of peroxide of hydrogen.

Dr. Richey: — Merck's peroxide of hydrogen solution contains thirteen volumes of the gas, but after it has been used a while it is less efficient. I generally have it put up in one ounce glass-stoppered vials in order that it may retain its power until the last.

Dr. Fryer: — It is important to keep the peroxide of hydrogen at a low temperature. I have used it successfully in the treatment of purulent discharges from the eye, as in gonorrhœal ophthalmia, but diluted it very much before applying it.

Dr. Pomeroy: — It seems to me that the retention of the gas in the water depends upon two facts. First, secure corking and, second, coldness. The cork should be tied. If the solution is warmed there is a disposition for the gas to escape. I have kept it in half-ounce bottles, tightly corked. The corks sometimes blow out. I have suggested that it be kept in something like the carbonic acid bottles, constantly under pressure. It could then be allowed to pass out by simply opening a valve.

The doctor has carefully described the brain symptoms in the two cases, and the one case differed from the other. The question which came into my mind was whether or not it would be possible to make a diagnosis from these symptoms. This may have been his object in describing the symptoms so carefully.

Dr. Bacon : — It seems to me that in this class of cases we are justified in examining the condition of the brain where we do not find pus in the mastoid cells. The Society may remember a case which I reported at the meeting last September in Washington and the remarks made by Dr. Weir at the time. It was a case of cerebral abscess. There was no pus in the mastoid cells and the bone was unusually hard. On trephining, however, over Broca's convolution a collection of pus was found in the brain. As Dr. Weir said at the time, it seems to me that with antiseptic precautions we are justified in this class of cases in trephining and investigating the cranial cavity, especially when we have perforated the mastoid process and found nothing.

Dr. Tansley : — I have had several of these cases and have given this subject considerable attention to see if there were any symptoms which in a case would indicate abscess as a certainty, and I am entirely unable to give any symptom or class of symptoms which will help us in deciding positively.

The symptoms in these cases are so many and varied and complex, and the part of the brain in which abscesses secondary to ear disease are located is so tolerant of pressure or irritation, that no positive decision can always be made. I have often thought of that somewhat Scotch verdict which was given by Dr. Agnew, of whom I am proud to remember that I was an humble assistant, who said upon seeing a patient : "I cannot tell, but the man has a rotten hole in his head, I think." I have had two cases in which the symptoms were almost precisely the same, with the exception that one had conjugate deviation of the eyes, while the other had not. Dr. Seguin, who saw the first case, made the diagnosis of abscess of the cerebellum solely from the presence of the conjugate deviation of the eyes. This was not a paresis or paralysis, but the patient

had a way of turning his eyes to one side. Dr. Seguin's diagnosis was proved to be correct by the post-mortem, which also showed how easily it could have been drained by a trephining.

The second case I gave a great deal of study to, and obtained all the advice I could get, but Dr. Seguin did not see the patient, he being out of town. Nobody seemed able to help me. As the patient was evidently going to die, I called in Dr. Weir, whose advice was to explore the mastoid and if nothing was found there to explore the brain. We opened the mastoid and found no difficulty whatever; then trephined the skull above the ear and passed a hypodermic needle into the brain substance, using a small and a large needle, the latter passing in some two inches or more, but no pus was found. Two days later another opening was made in the occiput and the same needles used to explore the cerebellum. Here also no pus was found. The patient died some six or eight hours after, and the post-mortem showed suppurative meningitis. I make these statements simply to show that so far as my observation goes there seems to be no way of making a positive diagnosis of abscess second to ear disease.

Dr. Risley: — I have been much interested in the careful analysis of the general symptoms of this interesting group of cases. Reasoning *a priori*, it seems to me that our principal dependence must be upon the temperature. In meningitis, it is probable that the range of temperature will be higher from the outset of the disease than in case of abscess. The symptoms pointing to intra-cranial pressure come on only when the products of inflammation have had time to accumulate, hence later in the disease, while, on the other hand, the pressure symptoms occur early in abscess.

Dr. Andrews: — I would ask Dr. Bacon what was the temperature in the case seen by himself and Dr. Weir.

Dr. Bacon : — I can not give the temperature exactly : it varied very much from 99° to 105°.

Dr. Andrews : — Was there a sudden rise?

Dr. Bacon : — There was at first, but not afterwards.

Dr. Andrews : — I ask these questions because during the past few years I have made a great many autopsies, not all my own cases, but also at the request of my colleagues, in which death had resulted from brain abscess either secondary to injury of the skull or secondary to middle ear trouble. My experience has been corroborative of that of many others in regard to brain abscess, which is, that brain abscess may form and continue a considerable time without any very positive symptoms either in rise of temperature or general systemic disturbance, but where there is purulent meningitis or phlebitis, especially the latter, the trouble is apt to be ushered in by a chill and sudden rise of temperature. It is very probable that in the case referred to by Dr. Bacon, phlebitic trouble should have been looked for rather than abscess. When the two conditions exist, it is the meningitis which will give the pronounced symptoms, and any search for an abscess will be useless. I should like to mention a case of advanced mastoid disease together with cerebral abscess which I attended last year and which illustrates how, in extremely advanced conditions of mastoid disease, opening of the mastoid may afford great relief to the patient. The patient was a girl of fifteen, who came into the Charity Hospital much emaciated and in such a condition that I feared that she would die very soon unless something were done. She had had purulent middle ear trouble for some time and there were several fistulous openings in her mastoid process and one fistulous opening in the squamous portion of the temporal bone. Her temperature, the first day of her stay in the hospital, was 102° ; the second day it was 103°.

I cut down upon the mastoid, enlarged the fistulous

openings, connected some of them, and scraped out the mastoid cells, which were in a state of disease and filled with cheesy material. I washed out the cavity thoroughly and from that day the girl began to improve. By the end of the fifth week she had gained in flesh, was cheerful, had a good appetite, and the temperature was almost normal; so were the respirations and the pulse. During the sixth week the temperature went up, not very suddenly, however; the respirations and pulse also increased in frequency. She grew worse, but I felt that I had done all that could be done so far as making a liberal opening in the mastoid was concerned. She did not improve and the brain being exposed just beneath the opening in the squamous portion of the temporal bone, I passed a knife into the brain and evacuated a considerable quantity of watery, foul-smelling pus. She improved for about a week, when she suddenly developed dangerous symptoms. The temperature went up to 104° and I felt that that indicated the development of a phlebitic process and was not due to the abscess in the temporo-sphenoidal lobe. Two weeks after the opening of the cerebral abscess, she died. The autopsy made by Dr. Biggs revealed a large abscess cavity containing some cheesy matter in the temporo-sphenoidal lobe, together with a diffuse purulent meningitis at the base of the brain.

There was another point of some interest in connection with this case. When I first saw her there was some swelling of the optic disc. This disappeared two weeks after the opening of the mastoid and did not reappear in spite of the cerebral abscess, but I did not examine the eye for a week before death, so that I do not know the condition of the background of the eye while the meningitic process was going on.

Dr. Pomeroy: — I would say a word in regard to a case which I reported three years ago — a case of abscess of the brain secondary to tympanic disease. The patient,

a man, was in the hospital several weeks and the most characteristic symptom that he presented was a sudden, extraordinary, and unaccountable rise in temperature. He would be as well as usual and in half an hour the temperature would run up to 107°. This was tested by several different thermometers. I had here the advantage of all the resources of the neurological fraternity. Every test was applied to detect evidences of brain disease, but none could be found. Those of us who were familiar with the connection between brain disease and ear trouble thought that there was brain trouble. There were some few chills. Almost the only grave symptom was the sudden rise in temperature. The intelligence was unaffected until the last. The patient apparently became so nearly well that he was about to be sent from the hospital when he suddenly died after one day's illness.

There was found to be necrosis and caries of almost all of the petrous bone with an abscess in the meninges covering the petrous portion and another a short distance away.

I believe that it is impossible to make a very exact diagnosis in these conditions of brain abscess and meningitis secondary to middle ear trouble.

Dr. Mathewson: — My experience is that there are many cases in which it is difficult to make an exact diagnosis between meningitis and abscess. In fact, many of them are mixed cases. In the cases of pure meningitis which I have seen the pain has been more marked than in abscess with little or no meningitis. Where meningitis exists we are more apt to find optic neuritis, while in the pure forms of brain abscess I have noted a peculiar dark appearance of the retinal veins. I have seen this in two or three cases, and in one particularly where there was an absence of all positive signs of brain disease, which was only suspected from previous ear disease. This is not a neuritis but a dark full condition of the retinal veins.

Dr. Theobald: — Many interesting points have been brought up in this discussion. There is one point, however, which seems to me to be one of considerable importance, that has not been touched upon, and that is the treatment of the preliminary stage of these cases. I refer more especially to the second case reported by Dr. Wilson. It occurred to me, while the paper was being read, that a great deal more might have been done to prevent the supervention of the serious symptoms. The only treatment seems to have been steaming of the ear and after eleven days of constipation the use of enemata to move the bowels. I have found great benefit in the treatment of the early stage of such cases from local applications. One that I have used for a long time is a solution of atropia. I now combine it with cocaine. In other cases I use morphia and cocaine. The cocaine relieves the pain at once, while the atropia or morphia has a more permanent effect in relieving the inflammation as well as the pain. The administration of a brisk calomel cathartic, moreover, is an important adjunct to the local treatment, especially if the bowels are constipated. The bowels should certainly be moved twice, or oftener if necessary, by a purgative containing a liberal proportion of calomel. It seems to me that such treatment would have been likely in this case to cut short the inflammation, and we should not have had the interesting later developments.

Again after the first attack subsided it recurred in a few days and symptoms of cerebral implication appeared. Under such circumstances I think that mercury should have been again resorted to and should have been given in such doses as to quickly impress the system. I have seen cases in which pronounced symptoms of cerebral implications have disappeared under such treatment.

Dr. Kipp: — There is a matter of some practical importance which occurred to me as Dr. Pomeroy was

speaking of the use of the hypodermic syringe. I saw a gentleman introduce the hypodermic syringe into another part of the body with a view of discovering pus. The fluid withdrawn looked like pus, but on laying the swelling open a watery fluid was found. It was learned that the syringe had been washed in a strong solution of carbolic acid and some of this remaining in the syringe had coagulated the fluid, giving it the appearance of pus.

Dr. Tansley:—In the case in which we used the hypodermic syringe, the contents were at once examined under the microscope.

Dr. Fridenberg:—The latency of cerebral abscess which has been dwelt upon was a marked feature in two cases of death from cerebral abscess in which autopsies were made. In one case slight purulent discharge from the ear had lasted a year, but there had been no symptoms until a week before death with the exception of some irritability of temper. This irritability has been pointed out as a symptom of brain abscess: yet in a person otherwise apparently healthy we would not lay much stress upon a little show of temper, especially if as in this case there were no discharge from the ear discoverable except upon the closest examination. A week before the patient died he suddenly developed pain within the ear and slight tenderness over the mastoid, then fever, and finally symptoms of brain pressure. In the absence of a proper indication no attempt was made to open the mastoid and the patient died with the symptoms of meningitis.

We found a small abscess in the temporo-sphenoidal lobe containing about two drachms of pus which had ruptured into the ventricles. The roof of the tympanum was carious and the meninges were strongly adherent at this point. It is my impression that there were no symptoms until the abscess ruptured or was ready to rupture.

The second case was that of a man who had suffered with

purulent middle ear catarrh for years, but the suppuration had ceased. Two months before his death he began to suffer with headache. This disappeared under the application of ice to the head. It recurred and he was admitted to the German hospital. The temperature was then 101.5°. There was some pain on deep pressure over the mastoid process. Examination of the ear showed no suppuration, but the residue of old suppuration. The ossicles were gone, there was no vestige of the tympanic membrane, and the bone was congested. After the use of hot douches to the ear and ice to the head and mastoid process, the fever disappeared and headache passed away, and in two weeks patient was discharged. A week later he returned to the hospital with headache and a temperature of 102.5°. The same treatment was resorted to. The next morning he vomited and on the following evening he died. There was no convulsion, no strabismus, no paralysis, simply a gradual collapse of the respiratory and circulatory functions. When the man was dead it seemed probable that we had to deal with a case of abscess, yet we were unable to make a positive diagnosis or locate its position.

The autopsy showed an abscess containing two ounces of pus. This was enclosed in a capsule at least three fourths of a millimeter thick in the temporo-sphenoidal lobe, with the meninges adherent to the carious roof of the tympanic cavity. The pus was greenish in color and had a sweetish odor.

In a number of such cases it is absolutely impossible to make the diagnosis. In both of these cases there were no indications for opening the mastoid.

The cases reported by Dr. Wilson show that is useless to rely upon the trephine in opening the mastoid. In operating upon the mastoid in these cases it is desirable to also open the antrum. I think that can not be done by any instrument but the chisel, with which in at least ninety per

cent. of all cases you can reach the antrum and bring about a communication with the middle ear. As was said in this Society two or three years ago we can do with the chisel everything that we can do with the drill and much that we can not do with the drill. In the first case reported in the paper, the one in which no autopsy was made, it seems to me that the presence of bulging of the posterior upper part of the auditory canal would indicate pus in the antrum, and the fact that it was not reached by the drill is no proof that there was no pus there. The result of the case might perhaps have been different if the operation had been thoroughly performed. This bulging has been pointed out by Schwartze especially as demonstrating the presence of pus in the mastoid process. Even if there is no pus, the opening of the mastoid reacts upon the ear and the cerebral disease as a strong counter-irritant and by causing depletion. This is especially so when a large portion of the bone is removed, cutting through blood vessels and affording free drainage. When free communication has been brought about, the morbid products can be removed with a syringe. You then have what all surgeons now rely upon — thorough mechanical antisepsis by the removal of the secretions.

Dr. Sutphen : — These cerebral troubles almost invariably follow arrest of the flow of pus. Our first object should be to accelerate and bring about a free discharge. Occasionally we find the abscess quite a distance from the middle ear, as in a case which I reported a year or two ago, where there was a cicatrix near the antrum with which the abscess had communication. I think that we should look upon these cases quite generally as instances of local disease and we should employ fomentations and perhaps poultices to bring about a free discharge of pus. This I consider an important point.

Dr. Fryer : — There is one means of cutting short the

early stage of these troubles which I should be tempted to try if I had such a case, and that is the systematic use of pilocarpin. This cuts short acute inflammation in other cavities.

Dr. Reeve:—I have seen two cases of death in acute suppurative otitis. One case had the most abundant purulent discharge that I have ever seen. This continued from the beginning to the end of the attack. The patient had a bad family history. Some of her relatives had died of phthisis and others had had hip joint disease. Her death resulted from meningitis. The second case died of pyæmia.

If remarks on cerebral abscess in chronic suppurative otitis were in order, I might describe such a case. I have had one case in which the *latency* of the symptoms impressed me very forcibly. The patient was a lad who presented no symptoms of cerebral mischief until less than three weeks before his death. A few weeks before these symptoms made their appearance, he fell from a structure used for gymnastic purposes, upon his head. He had another fall shortly afterwards, and eighteen days before his death he fell a third time upon his head, with resulting hemicrania and vomiting, and a week later he began to suffer from cephalalgia and had high temperature. There was no paralysis at any time, no loss of sensation, no loss of consciousness, and no symptoms pointing to lesion of any particular portion of the brain. The right ear had been the seat of suppurative inflammation for a number of years and had refused to yield to treatment, but this had not been carried out very faithfully. I saw him in consultation about thirty hours before his death. I found optic neuritis and considered the case to be one of cerebral abscess.

The autopsy revealed an abscess in the right temporosphenoidal lobe of the size of a small orange, with a wall one fourth of an inch thick with large blood vessels upon

its inner surface. The abscess contained thick, mucoid pus, of a yellowish green color and most offensive odor, and was evidently chronic. Around the sac there was a zone of one third of an inch of yellow softening which was evidently recent and doubtless had given rise to the acute symptoms.

This case was very instructive to me. I had thought it was impossible for a cerebral abscess to have a thick wall and yet be recent, and was therefore especially interested in the case reported by Dr. Carmalt to the Society in which he was certain there could have been no pathological condition of the brain prior to receipt of injury six weeks before the patient's death, although at the autopsy an abscess with a thick wall was found.

Dr. Randall: — Last year when I took charge of my hospital work I found a case with both ears discharging and with caries of both auditory canals. On the left side all of the mastoid tissues were involved, and there was a large opening in the posterior wall of the meatus. There were many granulations which I cleared away and cleaned the cavity — doing the same thing on the other side. There was prompt improvement. On the right side suppuration entirely ceased and the parts cicatrized. On the left side there was also improvement. At the posterior part I got a firm layer of tissue, and at only one point, toward the roof of the tympanum, could I find any area where there was a tendency to exuberant granulations. The case did admirably from an otological point of view, but she was a strumous subject in bad condition, and I turned her over after six weeks to my surgical colleague for the necessary treatment of a diseased thumb and elbow joint. During six weeks I found the discharge from the ear growing less and less, but the general condition was steadily deteriorating and the patient died about the last of the year. About one hour before death there was

a sudden discharge from the ear of at least two ounces of fetid pus. The temperature had been a little above normal. There had not been the subnormal temperature sometimes seen in abscess, nor the high temperature of thrombosis or meningitis. There was no meningitis, but a large abscess cavity, as large as a hen's egg, in the spheno-temporal lobe about half an inch from the tympanum but connected with it by a sinus. There was also attachment of the meninges. A large ante-mortem clot was found in the lateral sinus. There had been no indications of brain trouble, yet I had attempted to examine the eyes: but the rapid movements of the ball and slight opacity of the cornea rendered it impossible to make satisfactory examination. There was irritability of temper but no other special symptom of brain trouble.

There is one point in regard to exploratory trephining of the cranium where there is more or less indication of abscess of the brain without clear localizing symptoms. One such case occurred in the practice of Dr. Nancrede where there were no localizing symptoms but where the man was evidently going down hill, and it was thought perfectly justifiable to operate. The point selected for the application of the trephine was an inch and a quarter behind and an equal distance above the upper posterior margin of the osseous meatus, where we can feel a small spine or depression. Through such an opening any point of the spheno-temporal lobe can be reached. In the case referred to the surgeon had barely removed the portion of bone when he was told the patient was dead. He, however, passed a knife into the brain with the result of evacuating two ounces of pus and with the pleasant surprise of having the patient come to life. The patient died five or six days later from a general pyæmic condition.

The point indicated is an admirable and safe point at which to perform exploratory trephining in cases of sus-

pected abscess of the brain. Of course it is rather high to reach the cerebellum. It is, however, away from all the major blood vessels: and I think that it would be possible (although there is a preferable point) on failing to find an abscess in the cerebrum, to pass the knife through the tentorium into the cerebellum, where would be the next most likely place to find pus.

Dr. Wilson: — With regard to the differential diagnosis between meningitis and abscess, I think that it is not quite fair to say that we are all at sea. There are cases in which these two conditions can be differentiated. The most important single symptom is the temperature. The range of temperature is almost uniformly higher in meningitis than in abscess.

In regard to the treatment of case second. It had not occurred to me that I had been remiss except in one point. The only point that suggested itself to me was whether or not I should have performed paracentesis earlier in this case. The man came to me with subacute otitis without severe pain. I thought it sufficient to keep him at home, have him steam the ear to relieve the pain, and watch the case. The pain entirely subsided and I kept him in two days longer than seemed really necessary. In regard to the constipation, it was of six days' duration, not eleven as was stated by Dr. Theobald.

With reference to what might have been done in the doubtful case, I do not know. The autopsies in the other two cases showed that no operation with any instrument would have been of the slightest benefit.

Of course having presented the drill I feel called upon in a certain measure to support it. It seems to me that we can work more rapidly with the drill than with the chisel. We set the guard at the desired point, make a few rotations and examine, then a few more rotations and another examination. The time is taken up almost entirely with the examination.

I can not agree with the gentleman who advocates taking off the entire outside of the mastoid. It seems to me that the principal object aimed at in this operation, is to get at the pus and obtain drainage. If we make a large enough opening to secure drainage, that is enough. It doesn't seem to me that for counter-irritation alone we should be justified in taking off the outside of the mastoid. After going in half an inch or three quarters of an inch, I must say that I think the drill safer than the chisel. Then the chisel must be driven directly inwards. You can not drive it down the side of the head, as you can while removing the outer table of the mastoid. It seems to me that to drive the chisel accurately, chipping off the bone you wish and that only, requires more manual dexterity than to use the guarded drill, which can only enter up to the guard. If any one will try to chip a stone in a marble yard, he will find it difficult to take off just the sized piece that he wishes. The chisel is also more apt to slip than is a guarded drill.

The drill, however, is presented as an *addition* to our present instruments. Mastoid operations are so irregular and important, that I do not think that even now we have enough instruments for their performance in the best possible manner. All honor to the man who, when in a corner, *can* open the mastoid with a gimlet, but it is a very different thing to advise the habitual use of the gimlet or any other single instrument. I always take chisels with me to an operation and sometimes use them. I am not tied to drills because I have invented one.

Dr. Reeve (evening session) : — In discussing the paper of Dr. Wilson this morning, I thought that it referred to acute cases only, and I should like to say that several years ago I reported fifty cases of so-called trephining of the mastoid in otitis of varying duration in which there were ten deaths. In only one case could I attribute the fatal result to the operation.

COMPLETE CLOSURE OF BOTH EXTERNAL AUDITORY CANALS BY BONE IN A PATIENT HAVING GOOD HEARING POWER, WITH A PREVIOUS HISTORY OF CHRONIC SUPPURATIVE OTITIS MEDIA.

By E. E. Holt, M. D., *Portland, Maine.*

This case seemed to me to be of peculiar interest and unique in itself, inasmuch as no similar one has ever been observed and reported.

T. M., aged 18 years, consulted me in April last for an affection of the eye of a phlyctenular nature. On the second visit there was circumscribed keratitis with marked infiltration of the corneal tissue, which finally cleared up in the course of six weeks. A remark, made in a rather low tone of voice with the patient's back to me, not being heard, caused me to make an inquiry as to the hearing. His mother said he had abscesses in both ears when seven years old and the ears discharged more or less of the time for six years, but stopped entirely five years since. On examination I was surprised to find the canals of both ears of about half the usual length and occupied by a continuation of the skin of the meatus, with no appearance of the membrana tympani.

Carefully removing a little wax and epithelium it was found that the skin of the meatus was continuous over a complete closure of the canals of both ears by what appeared to be bone by all tests employed. Striking these obstructions with a probe produced the same sensation as when the mastoid was struck, and produced no more disturbance in the patient. Measured on a level with the

tragus the distance in to the obstruction was twenty to twenty-two millimeters, and from the external opening of the meatus about ten to twelve millimeters, thus placing the external surface of them midway in the external auditory canals.

The hearing power for the voice was good. Indeed, he was studying stenography and practicing typewriting with the intention of following these occupations. My stop-watch was heard only when close to the ear: the tuning-fork was heard about ninety seconds, both by bone and aerial conduction. König's rod of thirty thousand vibrations per second was heard by both ears. Further tests showed that he heard less distinctly when both ears were closed by pressure on each tragus. Shutting the mouth and closing both nostrils did not seem to affect the hearing much, if any. Closing both ears by pressure on each tragus diminished the hearing power, but it was not much, if any, further affected by closure of the mouth and nostrils.

These experiments seemed to show that the patient heard through the natural channel of the external auditory canals, yet I am certain from repeated examinations that the canals were closed by bone, and no opening existed in the skin which covered it and was continuous with that of the walls of the canals.

Cases with closure of one meatus with the skin of the canal continuous over the obstruction have been observed, but the hearing power was very defective, as the following case will show.

Miss A. M. D., aged 28 years, consulted me in October, 1887, for loss of hearing in the right ear. She said she had taken a sudden cold. On examination, a large perforation was observed in the anterior inferior portion of the membrana tympani. Said she used to have a discharge from both ears, but the left had stopped and the hearing

was of little or no use. Examination showed the meatus closed about midway, but there was no evidence that the obstruction was anything more than cicatricial tissue and skin. At the Brooklyn Eye and Ear Hospital they proposed to make an opening through this obstruction, which they assured her would be a safe operation and would probably give her hearing in that ear, since she could hear the tuning-fork by bone conduction much longer on that side.

Cases like the following, with a small opening between the exostosis and walls of the meatus, are not uncommon.

F. E. B., aged 39, consulted me in December, 1881, saying that during a hot day on the July previous his right ear stopped up. On examination I found the meatus completely closed by a hard substance like bone. Syringing the ear and removing some cerumen and epithelium a small opening about a millimeter in diameter was found in the anterior inferior part of the meatus. Clearing this small opening made his hearing seem all right and increased it from hearing the tick of the watch on contact to half a meter away. This small opening has become obstructed and affected the hearing three times in the eight years since coming under my observation. In the obstruction of the meatus by cerumen, cases are not infrequently observed where the external auditory canal is completely closed by inspissated and hardened cerumen, and yet the hearing remains good. In the closure of the canals by bony growth covered with skin, the result of chronic suppurative otitis media, the conditions are different and it would be interesting to know how this patient hears so well under conditions which ordinarily are so unfavorable to the hearing power.

DISCUSSION.

Dr. Theobald : — It is a mistake to refer to this case as unique. Four or five years ago, I reported an almost precisely similar case. The history was the same and the condition of the ears was the same with the exception that the newly formed membrane was closer to the outer orifice of the auditory canal. The hearing power was about the same. It was not difficult to carry on a conversation with this person in an ordinary tone of voice. There was evidently a bony obstruction. There was a history of suppurative otitis media some years before. I saw the patient twice, once some time before I reported the case and again just before reporting it. There was no appreciable change during the interval.

Dr. Randall : — I have had one case in some respects similar to that reported by Dr. Holt. It is one of the cases included in my paper, as on one side there was perforation of Schrapnell's membrane. She had almost absolute deafness on the left side, with a history of scarlatinous otorrhœa in both ears. There was everywhere firm bony resistance to the probe, and the end of the meatus was rounded at about half the ordinary depth. There was no evidence of exostosis. This case differed wholly from that of Dr. Holt in that there was such defective hearing.

Dr. Pomeroy : — I have seen one case in which there was complete closure of the meatus. The hearing was fairly good by aerial conduction and augmented by bone conduction. Whether or not the part is filled by solid bone in such cases can only be determined by operation. I have opened canals obstructed by bone, but I have not met with a single case in which the bony closure was absolute. These cases were operated on unsuccessfully. There was evidence of bone everywhere, but on careful examination with a stout probe, I was able to introduce it through a

minute fissure. I afterwards drilled this out with a cross-cut burr drill, two lines or two and a quarter lines in diameter. The difficulty was to maintain the opening. This and another case convinced me that it is rare to have complete bony closure. The operative treatment has been so unsuccessful that I do not care to enter into its consideration. My reason for operating was the presence of recurring granulations at a given point.

OTITIS MEDIA CATARRHALIS ACUTA, ACCOMPANIED WITH FACIAL PARALYSIS AND IMPAIRMENT OF ACCOMMODATION OF THE EYE OF THE AFFECTED SIDE.

By E. E. Holt, M. D., *Portland, Maine.*

Judging from statistics of diseases of the ear one would be led to infer that paralysis of the facial nerve in connection with acute catarrhal inflammation of the middle ear was not a common complication. This is undoubtedly true from the standpoint of the otologist, because, the pain in many cases having been slight and having passed off and the paralysis having come on, the patient's attention is directed to this and he seeks advice for this affection. An examination of the ear is too often neglected and the cause of the paralysis is recorded "a cold" or "rheumatic." It appears that Sir William R. Wilde, of Dublin, was among the very first to draw attention to this fact, for he wrote over forty years since that he was "strongly inclined to think that many of the cases of paralysis of the seventh pair of nerves, where we have no mechanical lesion, such as caries or exfoliation, and which heretofore we usually attributed to colds, etc., may have been caused by some form of otitis." Subsequently he had extensive opportunities for testing his belief and he did not meet a single instance of Bell's paralysis unaccompanied by manifest disease, or its results, in the middle ear.

Writers on otology since that time have recorded opinions coinciding with that of Wilde's, and yet they allude to the subject in such a manner and so briefly that one would be led to the conclusion that their experience was limited.

Examination of statistics of charitable institutions show but a few cases recorded even where diseases of the nervous system are treated in connection with those of the eye and ear. Considering how frequently the cavity of the tympanum is subjected to catarrhal inflammation, so familiarly known as earache, and how often it is neglected and forgotten, and remembering that the Fallopian canal is separated from this cavity only by mucous membrane and a thin plate of bone which is often deficient, is it not reasonable to suppose that in many cases the inflammation extends to this canal, thus exposed, and produces paralysis of the facial nerve in cases whose etiology is ascribed to indefinite causes?

With no hope of developing anything new I have ventured to bring this subject before you, and beg leave to report the following case as illustrating this class of cases.

F. A. L., aged 24, has always enjoyed excellent health, consulted me May 19th, 1889, stating that seven days since he took cold while fishing and his right ear began to pain him that night, but he was able to sleep. This pain continued more or less severe for three days, when it subsided, and on the fourth day he found he was unable to use his lips as formerly. Examination showed all the characteristics of facial paralysis, the more prominent of which will be observed in these photographs. The membrana tympani showed the lower portion reddened, but not to that extent but it might be overlooked by one not constantly examining the ear. His hearing power for the voice was apparently normal, since the left ear was unaffected, but upon testing his right, it was found he could only hear the tick of the watch close to the ear. Questioning him further, he said he had pain in that ear followed by a discharge twelve years previous to this time and that the ear had been deficient in hearing since. This was a case of inflammation of the tympanum, primarily, which extended

to the Fallopian canal and produced paralysis of the facial nerve, but it is one of those which undoubtedly forms a large part of the so-called rheumatic paralysis of this nerve. On testing his eyes I found paralysis of the accommodation of the right eye. This I knew to be a fact, for I had had him for a patient several years before and had recorded the test of his eyes; also by the fact that since the improvement of the paralysis of the face the paralysis of the accommodation has disappeared.

I have noted paralysis of the accommodation in cases of facial paralysis in which there was chronic suppurative inflammation of the middle ear, but never have been able to explain just how they were connected.

Another case, of which I have photographs, coming soon after the one here reported, illustrates how easily the ear may be overlooked in Bell's paralysis.

This was a girl about twelve years old who came to the department for nervous diseases of the Maine Eye and Ear Infirmary. She had developed paralysis of the facial nerve a few days previous to this time. No mention of the ear was made; indeed, she had to stop and think before she replied affirmatively to my question whether she had pain in the ear. Examination of the ear showed that the inflammation had involved the middle ear, and without doubt was its starting point; yet it is very certain that if the patient's account of the affection had been taken without a thorough test of the ear the cause would have been recorded "a cold" or "rheumatic." In this case the accommodation of the eye was but slightly affected. There was, however, no positive proof that it occurred in connection with the facial paralysis, no previous examination having ever been made.

LUX ENG. CO. BOSTON.

THE PHYSIOLOGY OF THE INTRA-TYMPANIC MUSCLES.

By S. O. Richey, M. D., *Washington, D. C.*

"Self-preservation is the first law of Nature" is axiomatic, but the usual interpretation of the proverb is in its relation to volition. The true significance of the expression is much broader, for Nature acts according to this law regardless of the judgment, or aid, of the individual, though not always successfully in face of his opposition. More than this, Nature places a premium of the better development of power, or dexterity, and facility in action upon the proper and rational use of the means of protection which she affords. "Struggle for existence" presupposes that it is *difficult* to live: that there is opposition to continued existence with which all animals have to contend. Opposition indicates effort: effort suggests means, purpose, and development.

In a paper on "The Primary Physiological Purpose of the Membrana Tympani," read in September, 1888, at Washington, D. C., an *intention* for the drum-membrane other than the transmission of sound impulses was discussed. From it follows a *deduction* as to use of the intra-tympanic muscles, an addition to this function as ordinarily understood.

If the membrana tympani in purpose protects the aural tissues lying interior to it, these muscles being appendages to the membrane are designed to assist the purposes of the membrane, which they do in part by *protecting* it from injury by the impact upon it of sound impulses violent enough to rupture an inflexible membrane, firmly attached,

and having such a plane as to expose it to the fullest force of the concussion. The membrana tympani fulfills but one of these conditions: *it is firmly attached.* "I think it may be fairly inferred that the function of the tensor tympani muscle is to *protect*[1] the membrana tympani and the labyrinth from injury during loud sounds: while the stapedius muscle places these structures in a position to be impressed by the most delicate vibrations." (Toynbee, "On the Functions of the Muscles of the Tympanum in the Human Ear," British and Foreign Medico-Chirurgical Review, 1853.) Henle (Eingeweidelehre, p. 749) thinks the stapedius acts as a guard, when the stapes might, by undue force, be driven into the oval window. "A violent blow on the ear with the palm of the hand rarely produces mischief to the membrana tympani *when its reception is expected;*[1] whereas a comparatively gentle but *unexpected*[1] blow frequently produces, not merely concussion of the nervous labyrinth and serious derangement of the functions, but not uncommonly ruptures the membrana tympani itself." (Toynbee, Dis. of the Ear, 1860, Philadelphia, p. 206.) Toynbee refers to previous writers, Mons. F. Savart in 1822, Mr. C. Brooke in 1843, and later Professors Todd and Bowman, as taking the same view of the subject: that the membrana tympani with its appendages, the ossicles and muscles, is in function analagous to the iris. However much we might expect to find some conclusive statement upon so important a subject in the chapters devoted to physiology in later treatises upon the ear, I have not been so fortunate. The purpose of this part of the organ is indicated to be the transmission of sound, making reference to no other function, though that mucous membrane in other localities becomes dermoid in character when freely exposed abnormally is not questioned.

The external meatus, containing cerumen and hairs, ad-

[1] Italics are mine.

mits sound waves and affords protection to the drum-membrane: from insects, by the hairs and cerumen: from solid foreign bodies, by the hairs, cerumen, and the *shape* and *direction* of the canal: the curved course and the shape of the external meatus, flared at both extremities and narrowed in the middle, diminish the force of impact upon the drum-membrane of a column of compressed air: the oblique position of the membrane to the meatus, and its motility aiding this effect. The most obvious purpose of the intra-tympanic muscles is that of adjustment of the membrane, by their involuntary action, to the best condition of tension, or relaxation, and thus its relation to the column of air in the auditory meatus, to resist the *sudden* impact of air upon it.

Contraction of the palatal muscles, *and opening of the Eustachian tube*, is prompted by excitation of the trigeminus and the consequent contraction of the tensor muscle (Voltolini, Virchow's Archiv., band, 65, p. 467). The tensor tympani and the stapedius are supposed to be *involuntary* muscles:[1] the ligamentous bands act as supports.

Deduction.—Contraction of the tensor tympani causes motion of the malleus towards the inner tympanic wall, produces tension of the ligamentous bands supporting the ossicular articulations, contraction of the palatal muscles, and opening of the Eustachian tube, admitting a column of renewing air to support the membrane against the pressure of the air from the direction of the external meatus. This action is instinctive and involuntary, a shrinking from apprehension. The trigeminus governs this, as it does the same action of the eyelids.

The muscles are kept in a state of perfect action by their constant exercise in the performance of the other, and

[1] They are also somewhat subject to volition.

possibly more important function of adjusting the transmitting apparatus to sound waves of varying values.[1]

DISCUSSION.

Dr. Pomeroy : — On theoretical grounds I have directed my patients to follow certain gymnastic exercises to strengthen the muscles which control the calibre of the tube. In chronic inflammatory conditions of the tube, I have directed the patient to swallow many times a day. I have told him to swallow ten extra times at each meal. I have, however, seen very little effect from this. In one or two cases, the patients have stated that the tube has become more pervious and supplied air to the tympanic cavity better than formerly and that the symptoms of obstructed tube were less marked. I would suggest that those who are interested will try this, as it does no harm and may do some good.

Dr. Bacon : — I do not believe that rupture of a normal drum-membrane occurs from a blow, unless it be a very severe one, or from a concussion, unless very loud. In a number of cases which I reported in the New York Medical Journal about two years ago, I examined the condition of the drum-membrane and of the Eustachian tube in each case. In most of the cases there were catarrhal changes in the drum-membrane and generally there was some obstruction to the entrance of air through the Eustachian tube.

Dr. Risley : — The presence of tubal catarrh or disease of the pharynx will often prevent the ready entrance and exit of air to and from the tympanic cavity, and thus render the drumhead more liable to injury from sudden external pressure. Some years ago I had a very unpleasant experience myself, which I interpreted in this way. Being troubled with a pharyngeal catarrh involving the Eustachian

[1] It would be interesting to know, if possible, whether in cases of rupture of the membrana tympani by aerial concussion any impairment of the process above described previously existed.

tubes, I learned to dread the sudden or hurried closing of the carriage door, unless the opposite window were open, thus preventing the rapid compression of the air which took place in the confined space by the forcible closing of the door of a tightly closed carriage. I believed at the time that the annoyance was due to the fact that the tympanum could not relieve itself, when the membrane was forced inwards, owing to the swelling of the lower or pharyngeal end of the tube. Under such conditions, although we may know that the pressure is to come, we are unable to protect ourselves against it, because of the absence of the normal ready interchange of air between the pharynx and tympanum.

Dr. J. F. Noyes: — I have always held the opinion that fracture of the drum-membrane occurred more frequently than we are aware. I had many cases come to me at the close of the war in which the rupture had been produced by explosions although it was known that the concussion was about to take place. Gunners have told me that they have sometimes prevented this accident by opening their mouths. I have known fracture of the drum-membrane to be produced also by a violent slap of the hand.

Dr. Randall: — There is a good deal of difference of opinion in regard to the function of these muscles. Dr. Sexton ascribes very little function to the intra-tympanic muscles, but a great deal to the muscles of the external ear. I have considerable power over the muscles of the external ear: but do not find that they increase the tension of the drum-membrane or sharpen hearing.

I have also voluntary control of the tensor veli palati and this gives me control over the tensor tympani. I can retract my tympanic membrane, change the form of the light spot and give rise to the ordinary crackling sensations, which are probably due to the separation of the moist walls of the Eustachian tube and not to any tympanic condition.

The sound can be heard at a distance of several feet by any one who is listening. The action of the tympanic muscles under these circumstances is such as rather to lessen my hearing than to increase it. This is, however, a subject on which we need more light.

Dr. Andrews: — I would remind the gentlemen of the case published by Lucae, the case of Professor Klebs, of Berlin, who could voluntarily contract his tensor tympani muscles. The test made brought out certain facts, the details of which I do not now recall, but I remember that Lucae saw a distinct movement of the drumhead inward, when Klebs made the effort to contract his tensor tympani muscle. Klebs heard, through air and bone, the deeper tones decidedly stronger as soon as he contracted his tensor tympani.

Dr. Pomeroy: — I wonder if I have been mistaken all my life in associating these crackling sounds with conditions of the Eustachian tube in which it is too pervious or too impervious, that is, the air supply to the tympanum is not evenly regulated. I have taught that this crackling sound was associated with the interchange of air between the throat and the tympanum. It may be that I have come to this conclusion without sufficient evidence. The act of deglutition often produces a crackling sound in the ear, that I believe is associated with an interchange of air between the pharynx and the tympanum. Sometimes there is too much air forced into the tympanum, and again there is too little. In either event the interchange of air is associated with a movement of the drum-membrane causing a crackling sound. I do not know whether this belief is supported by a sufficient amount of exact observation, or not.

Dr. Randall: — In my experiments I am conscious of two sounds. I can get a distinct crackling which I ascribe to the separation of the tubal walls by the tensor veli, and

at the same moment without any notable change in the membrane except a drawing in, there is a sharp clicking sound. There is also on yawning a distended feeling, with some rustling as though the membrane were released by the entrance of air. Gentle swallowing rarely causes a sound in the ear itself.

Dr. Tansley: — I can open and close my Eustachian tube and also retract the drum-membrane. This has no effect upon the hearing except that occasionally when the Eustachian tube is a little clogged with mucus I can open the tube and the hearing is improved, much in the same way as winking will wipe away the mucus on the eye. It is now a number of years since Dr. Pomeroy looked into my ear and saw the drum-membrane move. I can hold the Eustachian tube open, draw air into the nose, and inflate the tympanic cavity.

Dr. Richey: — The statement of Dr. Randall that the sound seemed to be deadened would support the idea advanced by my paper that the effect is to convert the tympanic cavity into a kind of air cushion. This is an involuntary act. I don't think that volition covers it exactly. It is an act of apprehension.

CYSTS OF THE AURICLE.

By H. Knapp, M. D., *New York*, N. Y.

Of late a number of cases of so-called cysts in the auricle have been reported and have occasioned some controversy among otologists. Not one case, however, seems to represent a genuine cystic tumor, such as we find in other parts of the body. They all were situated on the anterior surface of the pinna, and of rapid development, one day (Blake) to several weeks (Hartmann and others). They either were the result of traumatisms and contained a sanguinolent fluid, evidence of their being mild forms of othæmatoma, or they developed without known cause, mostly in the concha, but also in the upper part of the fossa helicis. Inflammatory symptoms were not very marked in most cases, but present in all, namely, swelling, redness, and tenderness of the integument. The development within two or three weeks in almost all cases distinguishes them clearly from the slow and absolutely non-inflammatory development of true cystic tumors. All recovered either by spontaneous absorption, aided in some cases by massage, or by incision which liberated a viscid liquid and laid bare a more or less uneven surface of the cartilage. All this agrees perfectly with the picture of perichondritis, distinguished only by the limitation of the disease, as in the cases reported, only one or two circumscribed cyst-like collections of exudation were noticed. In one case of Hartmann's there was a free communication between two cavities. Toynbee (Diseases of the Ear, p. 21) says: "The only kind of cyst to which the external ear is subject is that formed by an effusion of blood between the

cartilage and the integuments." Hartmann[1] classifies these swellings among the hemathomata, but declares the circumscribed collections of serous, viscid liquid to be genuine cysts, the contents of which may subsequently become sanguinolent and puriform. I have certainly seen more than half a dozen of these cyst-like subperichondrial swellings of the auricle, mostly in the concha. They corresponded to the description given above and got well quickly and without deformity. I have considered them as mild cases of perichondritis and am still, most positively, of the same opinion, for these mild cases of circumscribed perichondritis may, instead of getting well in several weeks, remain in this condition for a time and then develop into the full picture of a diffuse perichondritis. At present I have such a patient under my care, a lady of about thirty-three years of age, who for four weeks had a circumscribed, somewhat bluish-red tumor, the size of a filbert, in the concha of her left ear, almost filling the canal. The tumor was hard at first, but soon became soft and fluctuating. I did not open it, but gave the patient a salve. Then suddenly, in the course of a few days, the auricle became red, swollen, hot, and very painful, and the skin was studded with fine vesicles — sudamina. I painted the whole surface with a 3 per cent. solution of nitrate of silver and covered it with absorbent cotton. The swelling began to decrease in the upper part, but the lower part of the cartilage, especially the antitragus, remained hard, red, and greatly swollen for some time. Below the original tumor in the middle part of the concha there was another one distinctly fluctuating, which opened spontaneously, discharging viscid liquid. The lobule is red, but only little swollen, and neither painful nor uneven to the touch. In short, the case is a well marked example of perichondritis.

Entirely different from this is the picture of a true or

[1] Arch. of Otology, XV., p. 133, etc.

genuine cyst of the auricle, of which a typical case came under my care last winter. The tumor had double the size of a filbert, and occupied the angle between the mastoid and the upper two thirds of the pinna. It was a distinct cystic tumor, had developed without known cause, without pain or any inflammatory symptoms, in the course of a year. The skin was movable over it. The tumor was firmly connected with the cartilage of the ear and the adjacent periosteum of the mastoid. The patient, a girl of nineteen years, readily gave her consent to the operation, because the growth disfigured her. The case was first seen at the Dispensary of the New York Ophthalmic and Aural Institute by Dr. J. B. McMahon, who brought it to my notice and, with others, kindly assisted me in the operation after the patient had been admitted as an inmate to the above institution in January, 1889.

I made a vertical incision through the skin at the greatest convexity of the tumor, parallel with the insertion of the auricle. By patiently and carefully dissecting the skin off the tumor, I removed the bag unbroken. The most difficult part of the operation was to detach the growth from its basis, which was intimately connected with the perichondrium of the auricle and the periosteum of the mastoid process, dipping into the angle between them. The wall of the tumor was very delicate, pinkish and semi-transparent, as usual in serous cysts. Pressure or traction might have easily broken it. When the tumor was out, the pale periosteum of the mastoid and the smooth and white shining perichondrium of the auricle lay bare. The normal condition of these parts which had been the basis of the growth, proved that they were and had been perfectly free from inflammation. After arresting the moderate hemorrhage, I washed the comparatively large cavity of the wound out with corrosive sublimate 1 : 10000, and united the lips of the whole wound carefully by a dozen

silk sutures, drawing the threads through the perichondrium, in the depth of the wound, so as to leave no cavity. I placed a patch of sublimate gauze on the wound region, a pad of absorbent cotton on the gauze, and fastened both by a flannel roller passed around the head, i. e., over the vertex and below the jaw. The patient was kept in bed two days, and in the hospital three days more. There was neither bleeding, nor pain: in fact, she did not feel that she had been operated upon. She was dismissed from the hospital with the first bandage untouched, and was told to leave it undisturbed for a week. When she returned, the bandage, which was still in its place, was removed, and there was primary union, without a trace of swelling or discoloration of the skin, in the whole extent of the operation. I removed all the sutures, which came out dry and clean. The wound was left free. The patient returned several times: there was no relapse, and the scar from the incision is scarcely perceptible.

The tumor, which I pass round, has lain unopened in Müller's fluid for six months and is shrivelled to less than two thirds of its original size. It is oval, as you see, and measures now 27 mm. by 18. The cyst wall is hardened and thickened by the preserving fluid. The specimen has not been opened yet.

These tumors are not frequent in the auricle, yet they can not be so rare as we might infer from otological literature. Wilde[1] mentions them with the following words: "Morbid growths of the auricle are by no means uncommon: steatomatous and sebaceous bodies form in the concha; I have three times removed firm, encysted tumors, each the size of a hazel nut, from the posterior end of the helix." What he depicts and describes on page 168 is the ordinary cyst-like swelling in perichondritis. The case of

[1] Treatise, Am. ed., p. 166.

Böke[1] quoted by Urbantschitsch[2] is probably of the same nature. Wilde's encysted tumors were, it seems, sebaceous, a variety which is more common than the serous. A. H. Buck[3] saw two small ones in the auditory canal. Burnett, Roosa, and the majority of authors mention them. I have seen and removed a few myself. There seems to be about the same relation of frequency in these aural tumors as in those occurring in the adnexa oculi, — atheromatous cysts frequent, serous, at least the larger ones, rare; but the cyst-like formations on the anterior surface of the auricle, even if the symptoms of irritation are slight, should be considered as inflammatory products, i. e., a symptom of perichondritis auriculæ.

[1] Wiener Med. Presse, 1867, p. 286.
[2] Text book, 2d ed., p. 67.
[3] Manual, 1889, p. 121.

TWO NOTEWORTHY CASES OF TRAUMATIC RUPTURE OF THE MEMBRANA TYMPANI.

By Huntington Richards, M. D., *New York, N. Y.*

The following cases, observed by the writer during the month of May, 1889, presented certain peculiarities which render them worthy of record in the published Report of the Otological Society. To avoid a waste of time on the part of those whose curiosity may prompt them to read this attempted description, as well as on the part of such members of the Society as may chance to hear it read at the annual meeting, I shall abstain from reference to the comparatively commonplace and trivial features of each case, endeavoring to limit my own attention and to invite that of others simply to their more uncommon and more salient features, and shall supplement the brief verbal description by pen and ink sketches as accurately representative of the lesions observed as it is within my power to make them.

Case I. was seen at the Vanderbilt Clinic on May 7th. It was that of a woman about thirty years old, who, two days before, had received a box on the left ear. The symptoms were those of vertigo, tinnitus, and marked deafness. There had been no bleeding or other discharge from the ear. The membrana tympani showed some evidence of pre-existing tympanic catarrh, in that it was somewhat depressed and moderately atrophic. Save for the pronounced injection of the manubrial vessels and a narrow red line along either border of the gaping opening, it was not congested; the extensively exposed inner wall of the tympanum was likewise pallid and secreting only sufficient mucus to give its surface a glistening appearance.

Figure 1 shows the shape, extent, and location of the rupture. Figure 3 shows the drum-membrane nearly healed, and as it appeared sixteen days later; by which time the patient's hearing had greatly improved and (if I recollect aright) the tinnitus and vertigo had quite disappeared. The patient, on this, her last visit to the clinic, certainly considered herself quite recovered. Figure 2 shows an intermediate stage of the healing process. All three drawings are copied from sketches made on the spot and entered in the history book of the aural department. The centrifugal progress of cicatrization was throughout a marked feature of the case. Treatment consisted in successful efforts to induce the patient to leave her ear alone. For a few days I advised the wearing of a small loose cotton obturator in the auditory meatus; but this I subsequently discontinued because the patient seemed to have crowded it too far and too tightly into the canal.

Fig. 1. Fig. 2.

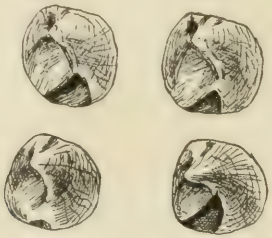


Fig. 3. Fig. 4.

Case II. was that of a woman twenty-three years old, who consulted me at the New York Eye and Ear Infirmary on the 24th of May. The pathological appearances were singularly like those observed in Case I., yet not identical, and the history of trauma was less clear. The location of the perforation and its shape were precisely those I had seen in the other case: its size was if anything a trifle larger. As in Case I., there was no discharge; and the patient said there had never been any, nor had there been any bleed-

ing from the ear. In this second case there was no congestion whatsoever, either of the membrane or of the tympanic wall. The membrane was greatly retracted and the other ear showed distinct but, as I recall the case, not especially marked evidence of catarrhal change. Figure 4, copied from a pencil sketch made on a prescription blank at the time of the first visit, shows the appearances seen in the ear with tolerable accuracy.

This patient, unlike the one seen at the Vanderbilt Clinic, had complained of aural symptoms for several weeks prior to my seeing her. These symptoms had been those simply of occasional slight pain in the ear. For their relief on May 21st, three days before I saw her, she had consulted a physician who had examined the ear by a head-mirror, had made the diagnosis of catarrh, and, during the examination, had introduced, so the patient said, a probe armed with cotton. This procedure had made her so dizzy that she was obliged to lie down immediately. Within two hours after the examination she discovered that she was very deaf in that ear. For manifest reasons I reserved my diagnosis and gave a guarded prognosis. The treatment advised was absolutely negative; even the wearing of cotton in the ear being forbidden.

Four days later, on May 28th, and seven days later, on May 31st, an examination showed that no change whatever had occurred. Tentatively, on May 31st, I stimulated the borders of the opening with a nitrate of silver solution, being careful to avoid an entrance of the solution within the tympanic cavity. I also insufflated an exceedingly minute quantity of powdered boric acid. A few days later the patient came to see me at the Vanderbilt Clinic, saying that her ear felt better, and that, if possible, she wished to move into the country. On examining the ear, I found, to my surprise, that the great wedge-shaped gap in the drum-membrane had healed across, save for a still persisting very small and circular

opening situated about midway between the malleolus-tip and the lower border of the membrane. I greatly regretted losing another opportunity of examining the now rapidly and suddenly healing membrane, but could not conscientiously tell the patient that she had better defer her moving to the country on account of her ear.

Cicatrization in the first recorded of these two cases occurred spontaneously, without doubt: I have no proof that it did not do so in the other also. The first case was from the start plainly due to trauma; the chief reason for believing the second to be due to the same cause — although not the sole reason — was the rapid closure of the opening.

A CASE OF EPITHELIOMA OF THE INTERNAL EAR.

By W. H. Carmalt, M. D., *New Haven, Conn.*

L. D. S., æt. 47, a very large and robust man, consulted me first about the 1st of June, 1888, for a suppurating ear (left) which had existed for forty-two years, following an attack of measles in childhood. He had gone through the war, from '62 to '65, with it and it had never given him any other trouble than the inconvenience of the discharge, until a few weeks before he consulted me, when it became quite painful in and around the ear and the discharge became exceedingly offensive. I found the external canal at a little distance from the meatus blocked up with a mass of ragged but firm excrescences, emitting a most disgusting odor, very sensitive to the touch, and discharging moderately. There was slight tenderness but no swelling or pitting over the mastoid. The pain radiated all through the side of the head and had prevented him from sleeping well for some time. Giving him directions for properly cleansing the ear, etc., he was told to come again, and on the second visit it was found that the left side of his face was completely paralyzed. Regarding the trouble as an epithelioma of the skin of the canal, I requested a consultation with Dr. Buck, who, while not speaking positively, inclined "rather towards a carious antrum," and advised an immediate opening of the mastoid, scraping it out, and at the same time "to clear the canal of its polypoid obstructions." Dr. Buck regarded his condition as so serious that it would not do to wait "a week"

before giving relief to the antrum. Accordingly, two days after, I attempted to open the antrum, but found, as Dr. Buck had suggested, the bone around it so sclerosed that the cavity was practically obliterated. At least I found nothing in the nature of an abscess, either old or recent, in the mastoid. I then prolonged the incision through the soft parts above and below in a semicircular direction around the external ear, carried the dissection into the external auditory canal, laying the ear well forward, and removed what polypoid masses I could get at, inserted a drainage tube from the external wound into the external auditory canal, and sutured the ear back into place. Nothing was accomplished by the operation except to establish the fact that the antrum was not involved and to give a freer exit to the discharges from the ear and to be able to wash it out better. The masses removed from the external canal proved to be carcinomatous.

The patient recovered fairly well from the operation, but in the course of a few weeks the ear became again blocked up, the growth extended along the track of the tube and involved the skin around it. The odor became unbearable, and with the object of alleviating some of the most distressing accompaniments and in the remote hope of being able to get rid of the disease I renewed the attempt to clean it out from behind the ear. By chiselling away the bone posteriorly I was able to get free access to the ear cavity, and with a sharp bone scoop the bone was scraped apparently clean. As was to be expected, no vestige of an auditory apparatus was met: it was simply a mass of papillary carcinomatous tissue. I then began the use of a solution of resorcin to wash out the cavity and for a while it looked as though a healthy granulating wound was forming, but there was evidently some part of the carcinoma left and it reappeared. The discharges again became intolerably fetid, the patient became exhausted

and at last bled to death without the condition being detected, from the erosion, probably, of the lateral sinus. At least he was found dying, with his pillow and bed clothes deluged with blood which was seen to pour out of the opening behind the ear. No autopsy was permitted.

My object in reporting this is simply to indicate another of the remote consequences of permitting a suppurative otitis to run its course.

DISCUSSION.

Dr. Kipp: — I reported a similar case some years ago and in looking up the literature I found that all of the cases reported had been preceded by purulent otitis, often since childhood.

PHOTOGRAPHY AND THE PROJECTION-LANTERN IN THE TEACHING OF OTOLOGY.

By B. Alex. Randall, M. D., *Philadelphia, Pa.*

In pursuance of a subject which Dr. Morse and I brought before this Society two years ago, I beg leave to show some more photographic illustrations; but to present them this time in the form of lantern slides to indicate how excellently photography may be made to serve us by the use of projections upon the screen in teaching our specialty. I have not limited the series now to the anatomy of the human ear and the pathology of the drum-membrane; but include clinical pictures and selections from preparations in comparative anatomy. Among the latter I may call attention to the preparations made by Hyrtl of the tympanic membrane, ossicles, and labyrinth of the elephant as of interest in connection with the demonstrations made here last year by Dr. Buck. As has been before stated, these plates are entirely free from retouching; so while their beauty may be less than skillful retouching would secure, they are unimpeachable in their accuracy. They have already served me well with my classes at the Philadelphia Polyclinic, and I propose to still further extend the series of which these form a part.

SOME CASES OF SUPERNUMERARY AURICLE AND CONGENITAL AURAL FISTULA.

By B. Alex. Randall, M. D., *Philadelphia, Pa.*

A well marked case of duplication of the auricle in a young man of twenty-two, under treatment for insufficiency of the ocular muscles, led me to note and sketch the cases of this character which have been observed during the past year. This first case is well illustrated in the photograph presented among my lantern slides. In the four other

cases of reduplication, all were rather inconspicuous, only one showing anything more than a cartilaginous nodule probably representing the tragus, and in all five cases the anomaly was on one side only. Three were in women, two in men; four were of the right ear, one only of the left.

I have also met one case of persistent aural fistula in a young man of twenty-one, who came because of furuncular

abscesses about the tragus. He pointed to the sinus as a "mother's mark" that had been discharging at times all his life. A probe was passed downward and slightly inward for about an inch without finding any suggestion of connection with the external meatus. It gave vent to a thin apparently purulent fluid, so I carried a fine cotton pledget charged with nitrate of silver to its bottom. No reaction followed and the tract has remained for several weeks dry and closed.

NOTE. Four more cases of rudimentary supernumerary auricle have been seen in the last three months: and one other case of aural fistula apparently closed.

DISCUSSION.

DR. KIPP: — I have sometimes seen aural fistulæ in several members of the same family.

VERBAL COMMUNICATIONS.

PEA RETAINED IN THE EAR FOR NINETEEN YEARS.

By T. Y. Sutphen, M. D., *Newark, N. J.*

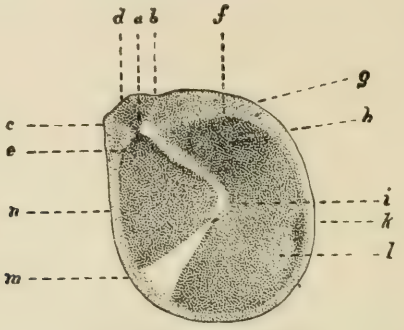
Allow me to present a mummified pea which I removed from the external auditory canal of a young man a few days since. Judging from the history of the case, it had evidently been there for nineteen years. After relieving the patient of cerumen in one ear, for which he sought treatment, he asked me to look at the other, which had been deaf since childhood. The trouble was attributed to measles. He heard the watch at one inch. Syringing the ear I found a pea encased in wax. Removing this brought the hearing almost up to normal. [The pea was exhibited.]

REMARKS ABOUT THE ANATOMY OF THE DRUM-MEMBRANE.

By Dr. B. Alex. Randall, M. D., *Philadelphia, Pa.*

There is a little point to which I wish to draw attention in relation to the anatomy and appearance of the drum-membrane as we see it clinically. We meet with very varying descriptions of the drum-membrane as seen in health. Among other things we are told that the anterior fold of the drum-membrane is fibrous. It sometimes has a very intense white appearance and, in certain pathological cases at least, it has seemed to me that we could actually see, as making up part of the anterior fold, the processus gracilis. Turning to the text books, I find that the processus gracilis is said to undergo retrograde metamorphosis into fibrous tissue in adult life, but evidently such a process

failed in these two adult specimens which I lay before you,



Normal Drum-membrane.

where the process is as perfect as in the infant. Such has been my experience without exception in the anatomy of the malleus so far as I have studied it. All cases showing a truncated processus gracilis show a *fractured* surface.

Another point is in regard to what we see in many cases posterior to the malleus handle in looking at a normally transparent or a pathologically retracted membrane. We often see clearly the descending process of the incus and running back from this a whitish line. In the books this is described as the posterior crus of the stapes. It surprises me that it should be so. A glance at the anatomy of the part shows that the stapedius tendon occupies the position of the structure in question. I have seen no reference to this in the text books. I question whether in any case where the incus was present, we could see the anterior crus of the stapes or even the posterior, if the stapedius tendon be normal. In a recent case, a perforation just below the posterior fold shows very clearly the tip of the incus-shank, and the stapedius tendon, perfectly recognizable, occupying the position indicated. I have of course seen the stapes uncovered and seen both of its crura; but when the incus is present and the membrane is so transparent as to reveal underlying structures, we should no longer speak of seeing the posterior crus of the stapes, but the tendon of the stapedius at this point.

In Memoriam.

Dr. E. Williams, Cincinnati, Ohio, one of the founders of the American Otological Society, resigned from active membership and elected honorary member, July 17, 1888, died Oct. 5, 1888.

Among the names associated with the development of ophthalmology, none is more familiar than that of Dr. E. Williams, of Cincinnati. The fact that he began the study of this specialty just as it was emerging from darkness into light under the inspiring genius of Von Graefe, was greatly to his advantage. He was the personal friend of Arlt and Jaeger, of Desmarres and Sichel, Bowman, Critchett, and many others besides Von Graefe, who devoted themselves to the study and investigation of diseases of the eye, which had received such a strong impetus by the invention of Helmholtz. Dr. Williams was born in Bedford, Ind., Dec. 19, 1822. His father was one of the pioneers of that section and was an active and influential citizen, and the owner of extensive farming lands. He gave his son as good an education as the home schools afforded, and, when he was far enough advanced, sent him to Indiana University, Bloomington. He finished his collegiate course at Asbury, now called De Pauw University. After graduating, he began the study of medicine and attended lectures at the University of Louisville, Ky., and while there received special private instructions from Profs. T. G. Richardson and S. D. Gross. He received his medical diploma in 1850 and for about two years attended to general practice. He

then determined to devote himself to diseases of the eye and went abroad. He first went to Paris, where he remained a year and later on visited Vienna, Prague, Berlin, and London, attending the eye clinics in these cities. He was among the first to learn the uses of the ophthalmoscope and soon became expert in diagnosis. His enthusiasm in his work and his natural love of study enabled him to grasp and appropriate the most advanced ideas of the day. He returned to Cincinnati in the spring of 1855, and began the practice of his chosen specialty. His progress was slow at first but it was nevertheless sure, and when his superiority as an oculist became known, his reward was as abundant as it was deserving. In 1856, the Miami Medical College made him professor of ophthalmology and otology, which position he held until compelled to relinquish it on account of failing health. As a teacher and lecturer he excelled. He was familiar with the literature of his specialty and kept up with the advances of the day. He possessed clear and definite ideas on the subjects he presented, and his excellent command of language enabled him to give them to his classes in a most entertaining and satisfactory manner. He had a warm and tender heart which was easily touched by the suffering of the poor and his devotion to this class ended only with his cessation from work. No man enjoyed more than he the confidence of his brother practitioners. His opinion was held in the highest esteem and was sought for by patients far and wide. He was a member of the International Ophthalmologic Congress ever since its organization, and in 1876 was its presiding officer. He was one of the three honorary members of the "United Kingdom" Ophthalmological Society. He was an active member of the American Medical Association as well as that of the Ohio State Medical Society, and was elected president of the latter in 1875. Dr. Williams was, in the earlier years of his practice, a frequent contributor to the medical

journals. His articles were clear, concise, and practical, and embraced the entire field of his observations. He wrote the article on diseases and injuries of the eye in Ashurst's Cyclopedia of Surgery. This is his most pretentious production, but it is not what he intended to give to the profession. It was his hope to write an exhaustive work in three parts.

S. C. AYRES, M. D.
W. W. SEELY, M. D.
Committee.

ALPHABETICAL INDEX

OF

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DR. EDWARD L. HOLMES, . 112 South Clark St., . . Chicago, Ill.
DR. E. E. HOLT, ... 723 Congress St., . . . Portland, Me.
DR. WM. H. HOTCHKISS, . 3813 Washington Ave., . St. Louis, Mo.
DR. LUCIEN HOWE, ... 183 Delaware Ave., . . Buffalo, N. Y.
DR. FREDERICK L. JACK, . 161 Boylston St., . . . Boston, Mass.
DR. SAMUEL J. JONES, . . Argyle Bg., 7 Jackson St., Chicago, Ill.
DR. CHARLES J. KIPP, . . . 534 Broad St., ... Newark, N. J.
DR. HERMAN KNAPP, . . . 25 West 24th St., . . . New York, N. Y.
Dr. J. W. Lawton.
DR. J. A. LIPPINCOTT, . . . 435 Penn. Ave., ... Pittsburg, Pa.
Dr. W. S. Little.
DR. F. B. LORING, ... 1420 K St., North West, Washington, D. C.
DR. C. J. LUNDY, ... 27 Adams Ave., East, . Detroit, Mich.
DR. ARTHUR MATHEWSON, 139 Montague St., . . . Brooklyn, N. Y.
DR. READ J. MCKAY, . . . 913 Market St., ... Wilmington, Del.
DR. C. S. MERRILL, ... 23 Washington Ave., . . Albany, N. Y.
DR. H. G. MILLER, ... 262 Benefit St., ... Providence, R. I.
Dr. W. W. Morland.
DR. H. L. MORSE, ... 112 Marlborough St., . Boston, Mass.
DR. HENRY D. NOYES, . . . 233 Madison Ave., . . . New York, N. Y.
DR. J. F. NOYES, ... Detroit, Mich.
DR. OREN D. POMEROY, . . 316 Lexington Ave., . . New York, N. Y.
DR. THOMAS R. POOLEY, . 107 Madison Ave., . . . New York, N. Y.
DR. J. S. PROUT, ... 26 Schermerhorn St., . . Brooklyn, N. Y.
DR. B. ALEXANDER RANDALL,
1806 Chestnut St., . . . Philadelphia, Pa.
DR. WM. RANKIN, JR., . . 23 Cedar St., ... Newark, N. J.
DR. J. M. RAY, ... 419 W. Chestnut St., . . Louisville, Ky.
DR. R. A. REEVE, ... 22 Shuter St., cor. Victoria, Toronto, Canada.
DR. HUNTINGTON RICHARDS,
19 East 38th St., ... New York, N. Y.
DR. S. O. RICHEY, ... 732 Seventeenth St., . . Washington, D. C.
DR. CHARLES E. RIDER, . 53 South Fitzhugh St., . Rochester, N. Y.
DR. FRANK W. RING, . . . 101 Park Ave., ... New York, N. Y.
DR. S. D. RISLEY, ... 1722 Walnut St., ... Philadelphia, Pa.
DR. D. B. ST. JOHN ROOSA, 20 East 30th St., ... New York, N. Y.
DR. JOHN D. RUSHMORE, . 129 Montague St., . . . Brooklyn, N. Y.

Dr. Wm. W. Seely,	S. E. cor. 4th and Broadway,	Cincinnati, O.
Dr. Ralph W. Seiss,	49 North 17th St.,	Philadelphia, Pa.
Dr. Samuel Sexton,	12 West 35th St.,	New York, N. Y.
Dr. J. B. Shapleigh,	2332 Washington Ave.,	St. Louis, Mo.
Dr. Henry L. Shaw,	159 Boylston St.,	Boston, Mass.
Dr. E. D. Spear,	6 Beacon St.,	Boston, Mass.
Dr. H. N. Spencer,	2725 Washington Ave.,	St. Louis, Mo.
Dr. George T. Stevens,	33 West 33d St.,	New York, N. Y.
Dr. S. B. St. John,	43 Pratt St.,	Hartford, Conn.
Dr. George Strawbridge,	1500 Walnut St.,	Philadelphia, Pa.
Dr. T. Y. Sutphen,	963 Broad St.,	Newark, N. J.
Dr. J. O. Tansley,	28 West 43d St.,	New York, N. Y.
Dr. Samuel Theobald,	304 West Monument St.,	Baltimore, Md.
Dr. William Thomson,	1426 Walnut St.,	Philadelphia, Pa.
Dr. Charles A. Todd,	2615 Washington Ave.,	St. Louis, Mo.
Dr. J. Vanduyn,	111 South Salina St.,	Syracuse, N. Y.
Dr. J. J. B. Vermyne,	2 Orchard St.,	New Bedford, Mass.
Dr. David Webster,	266 Madison Ave.,	New York, N. Y.
Dr. F. M. Wilson,	317 State St.,	Bridgeport, Conn.

American Otological Society.

The Twenty-Third Annual Meeting of the American Otological Society was held at Hotel Kaaterskill, Catskill Mountains, N. Y., on Tuesday, July 15, 1890. In the absence of both President and Vice President, the Society was called to order by the Secretary at 10.30 A. M. Dr. John Green, of St. Louis, Mo., was elected President pro tem., and directed the proceedings of the Society until the arrival of the President, Dr. O. D. Pomeroy, of New York, N. Y.

The following members were present:

Drs.	Frank W. Abbott,	Buffalo, N. Y.
	J. A. Andrews,	New York, N. Y.
	C. J. Blake,	Boston, Mass.
	F. P. Capron,	Providence, R. I.
	W. H. Carmalt,	New Haven, Conn.
	John Green,	St. Louis, Mo.
	N. J. Hepburn,	New York, N. Y.
	Lucien Howe,	Buffalo, N. Y.
	J. A. Lippincott,	Pittsburg, Pa.
	Arthur Mathewson,	Brooklyn, N. Y.
	Read J. McKay,	Wilmington, Del.
	H. D. Noyes,	New York, N. Y.
	O. D. Pomeroy,	New York, N. Y.
	Thos. R. Pooley,	New York, N. Y.
	J. S. Prout,	Brooklyn, N. Y.
	B. Alexander Randall,	Philadelphia, Pa.
	R. A. Reeve,	Toronto, Canada.
	Huntington Richards,	New York, N. Y.
	Chas. E. Rider,	Rochester, N. Y.
	S. B. St. John,	Hartford, Conn.
	Samuel Theobald,	Baltimore, Md.
	J. J. B. Vermyne,	New Bedford, Mass.

And by invitation:

Drs. Smith Baker, ... Utica, N. Y.
C. S. Bull, ... New York, N. Y.
A. A. Hubbell, ... Buffalo, N. Y.
W. B. Johnson, ... Paterson, N. J.
B. F. Milliken, ... Columbus, O.

The President appointed as the Business Committee Drs. W. H. Carmalt, S. B. St. John, and B. Alexander Randall, and also appointed Dr. S. B. St. John to fill the vacancy in the Committee on Membership, caused by the absence of Dr. S. D. Risley.

The Treasurer's Report was read and referred to Dr. J. A. Andrews, as Auditing Committee. Subsequently the accounts were reported to be correct and properly vouched for, and the Treasurer's Report was then accepted.

Dr. W. H. Carmalt, Delegate of the American Otological Society to the Executive Committee of the Second Congress of American Physicians and Surgeons, reported on the election of officers to the Congress, time and place of meeting, and subjects to be discussed at the meeting of the Congress.

The Committee on Membership made their report, recommending the election to membership of

Drs. Frederick L. Jack, ... of Boston, Mass.
J. B. Shapleigh, ... of St. Louis, Mo.
Benjamin J. Baldwin, ... of Montgomery, Ala.
J. M. Ray, ... of Louisville, Ky.
F. W. Ring, ... of New York, N. Y.

Who were all elected on ballot.

The reading of papers was then announced, and papers were presented in the following order:

1. Dr. Huntington Richards, of New York, N. Y. Mastoid Sclerosis, Illustrated by a Typical and Fatal Case.

2. Dr. Samuel Theobald, of Baltimore, Md. Report of a Case, in which a Septum closely resembling the Tympanal Membrane formed in the Middle Third of the External Auditory Canal and was Removed with Improvement to Hearing.

Discussed by Drs. Pomeroy, Andrews, Richards and Randall.

3. Dr. A. H. Buck, of New York, N. Y., read by Dr. Richards. On the Renewed Employment of the Nasal Douche and Kindred Procedures.

Discussed by Drs. Randall, Abbott, Richards, Andrews, Mathewson, and Pomeroy.

4. Dr. Lucien Howe, of Buffalo, N. Y. On the Removal of a Bullet from the Ear with the Aid of the Galvano-Cautery.

Discussed by Drs. Rider, Reeve, Theobald, Mathewson, Randall, McKay, Lippincott, Richards, and Andrews.

5. Dr. Richards, in behalf of Dr. A. H. Buck, stated that the paper on the Anatomy of the Elephant's Ear, published in the Transactions for the year 1888, was for a great part inaccurate, owing to the restrictions under which he was placed by Prof. Wilder, who desired to preserve the specimen in as perfect a condition as possible for the Cornell Museum of Anatomy. He submitted a corrected version for publication in the Transactions of this year. This paper, as also

6. Dr. Huntington Richards. A Further Report on the Anatomy of the Elephant's Ear, were read by title and referred to the Committee on Publications.

7. Dr. C. H. Burnett, of Philadelphia, Pa., read by Dr. Randall. Permanently Good Results of Excision of the Membrana Tympani and Malleus in a Case of Aural Vertigo, and in a Case of Chronic Suppuration of the Attic, and

8. Dr. B. Alexander Randall, Philadelphia, Pa. Some Further Notes on the Shrapnell Perforation.

The discussions on the two last papers were postponed to the evening session, and at 1 P. M. the Society adjourned till 8 P. M.

Evening Session.

The Society was called to order by the President at 8 P. M.

The records of the morning session were read and approved.

The discussion on the papers of Drs. Burnett and Randall, read at the morning session, was opened by Dr. Blake, who was followed by Drs. Theobald, Rider, Howe, and Pomeroy.

The reading of papers was then continued in the following order:

9. Dr. J. A. Lippincott, of Pittsburg, Pa. Mastoiditis Interna Purulenta, after Erysipelas.

Discussed by Dr. Randall.

10. Dr. N. J. Hepburn, of New York, N. Y. Case of Fracture of the Malleus-Handle.

11. Dr. O. D. Pomeroy, of New York, N. Y. Some Cases of Mastoid Cell Disease with a Fistulous Opening which Recovered without the use of the Drill or Chisel.

Discussed by Drs. Andrews, Abbott, Richards, Capron, Reeve and Blake.

The following papers were read by title and referred to the Committee on Publications:

12. Dr. F. M. Wilson, of Bridgeport, Conn. Three Cases of Acute Suppurative Otitis with Complications and One Death.

13. Dr. Robert Barclay of St. Louis, Mo. The Use of the Paper Discs; Case Histories.

14. Dr. Chas. A. Todd, of St. Louis, Mo. Aneurysm First Recognized in the Fundus of the Ear, later Appearing in the Neck.

The Society voted to request Dr. Gorham Bacon to continue the publication of his Alphabetical Index of Otological Literature for the ensuing year.

The Society then went into executive session.

The Business Committee presented the following list of officers for the ensuing year:

President:	Dr. Gorham Bacon.
Vice President:	Dr. Huntington Richards.
Secretary and Treasurer:	Dr. J. J. B. Vermyne.
Committee on Membership:	Dr. A. Mathewson. Dr. S. Theobald. Dr. S. D. Risley.
Committee on Publications:	Dr. J. J. B. Vermyne. Dr. C. J. Blake. Dr. J. Orne Green.

These officers were duly elected on ballot.

The Committee also recommended that the next Annual Meeting should be held on the day preceding the Annual Meeting of the American Ophthalmological Society and at the same place. Adopted.

The Records of the evening session were then read and approved, and at 10.45 P. M. the Society adjourned.

J. J. B. VERMYNE, *Secretary.*

MASTOID SCLEROSIS, AS ILLUSTRATED BY A VERY TYPICAL AND A FATAL CASE.

By Huntington Richards, M. D., *New York, N. Y.*

In preparing this paper upon sclerosis of the mastoid portion of the temporal bone I have aimed at a discussion of the pathological condition in its bearing upon the diagnosis, treatment, and prognosis of purulent otitis media, rather than at an attempted description of those cases, — exceedingly rare in occurrence, — wherein the existence of a sclerosing process has been clearly revealed during the life of the patient by special and characteristic symptoms. These self-revealing cases of sclerosis, — if I may be permitted to use the term, — fall under the observation of the aural specialist but very few times in the course of a long practice, and mastoid sclerosis is chiefly remarkable for the manner in which it habitually conceals its presence even from the eye of the trained diagnostician of ear diseases. On the other hand, sclerosis of the pneumatic and diploetic portions of the temporal bone is a frequent concomitant of a purulent inflammation of the tympanum and adjoining air-chambers when such inflammation has persisted for a considerable length of time: it is nothing more or less than a slowly developed over-growth, or rather over-deposition of bone tissue in the cell-walls of these pneumatic and diploetic portions, and is brought about by the long continued hyperæmia, or by the repeatedly recurring hyperæmias which accompany the long lasting inflammation. Through this increase of true bone elements cell-walls are thickened at the expense of cell-contents, and a more or less complete and more or less widely diffused obliteration

of cell-lumen is the consequence: the pneumatic and diploetic portions of the temporal bone become more or less widely and more or less compactly eburnated.

The practical bearing of this condition upon the value of certain symptoms commonly relied upon in estimating the gravity and in guiding the treatment of a chronic case of purulent otitis media is very great and is too often forgotten or disregarded. sclerosis of the bone not infrequently disguising a serious implication of the antrum and other mastoid cells occurring in the course of an inflammation which originally began in, and was then perhaps limited by, the tympanum proper. Thus it is a common thing for the absence of redness and swelling of the supra-mastoid integuments to be regarded as an indication that the mastoid cells are not implicated in a chronic inflammation of the middle ear, or that they are but little involved: and the absence of tenderness upon pressure over the mastoid region has, in like manner, not seldom produced a sense of false security in the mind of the examining physician. A moment's reflection upon the pathological condition will show why in cases of mastoid sclerosis the commonly found symptoms of supra-mastoid redness, swelling and tenderness may be absent, or but slightly manifested, in what is nevertheless a true and even a serious case of intra-mastoid disease. The vascular communication between the interior and the surface of the bone has become less free in a sclerosed mastoid process than it is in one not yet condensed and eburnated, and it is by the medium of this ordinarily quite free communication that these common indications of a deep-seated mastoid inflammation are brought to the surface. The same cause, — to wit, the obliteration of arterial and venous bone channels, often robs the observer of another valuable indication of intra-mastoid inflammation: — I refer to a redness and more or less bag-like protrusion of integuments covering the upper

and back wall of the osseous auditory canal in the immediate neighborhood of the tympanic ring, a protrusion which, as we all know, may by its extension lead to great stenosis and at times even to complete and dangerous closure of the canal. But a total absence of this last mentioned symptom would hardly be found save in a very extreme case of sclerosis, such as had progressed, — a rare event, — to complete or all but complete obliteration of the nearly always persisting mastoid antrum, viz., of the large pneumatic cell which immediately adjoins, freely communicates with, and constitutes an almost integral portion of the tympanic vault. On the other hand, the deep-seated, long persisting, or repeatedly recurring, and generally severe pain, so commonly indicative of mastoid implication, is not absent where the mastoid process is in condition of sclerosis: on the contrary, it is apt to be especially prominent as a symptom and to be especially severe in degree, because the vascular pressure upon nerve fibres which produces the pain is emphasized by the vascular impermeability and unyielding structure of the eburnated bone surrounding and confining the centre of active inflammatory hyperæmia. As to the comparative frequency of facial paresis in these sclerosing cases I cannot now speak with authority, not having had time at my command for consulting published records of such cases in order the better to determine this point. My own clinical experience leads me to believe this symptom to be at least as common in cases of sclerosis as it is in those where no sclerosis has been proved or where none may have been reasonably presumed to exist.

This much may suffice to show the beclouding effect upon diagnosis and prognosis produced by an already acquired sclerosis of the mastoid portion of the temporal bone. In regard to its effect upon treatment two things only call for especial mention: First, that this condition when well advanced in degree will operate to diminish the

efficiency of the local and strictly external procedures commonly and properly adopted for checking the progress of intra-tympanic and intra-mastoid disease or for relieving its symptoms, viz., the application of leeches or of dry or moist heat over the mastoid region, and even the "Wilde's incision": — measures, by the way, which are especially productive of benefit and relief in the exceedingly rare, less advanced, manifestly hyperæmic, and self-revealing cases of sclerosis: second, that the solidified and enlarged condition of the bone will be apt seriously to embarrass the operator who finds himself called upon to lay bare the centre of inflammation and to establish an adequate channel of escape for pent up pathological secretion by the use of drill or chisel.

Many of the points dwelt upon and touched upon in the brief discussion of mastoid sclerosis just presented will be more vividly and therefore more interestingly set forth by the following history of a case, which is appended as a graphic illustration of the truths I have attempted to emphasize in this paper. I give the history of the patient partly from notes taken during the course of treatment, partly from memory, my recollection of it being very distinct indeed, by reason not only of the interest it excited in my mind during the treatment, but also by reason of the short time that has elapsed since the death of the patient, and, finally, because the striking phenomena presented by the case have left a lasting impression upon my mind and furnished me food for much and I trust for profitable reflection.

The patient, a man 26 years old, of strong constitution and exceptionally powerful muscular development, first came under my personal observation on the 8th of March, 1890. He had called at the Ear Department of the Vanderbilt Clinic eleven months before that time, and on the occasion of this first visit a very large polyp had been

removed from the auditory canal of the left ear and other appropriate treatment had been prescribed. He had then been suffering from pain in the ear for four days and gave a history of aural discharge extending back over a period of ten years, the discharge being occasionally bloody. No further notes of the case were entered in the clinical record book until his visit to me above mentioned, but his symptoms had not been such as to lead him to seek relief on more than very few occasions during the long interval. On March 8th, 1890, the symptoms noted and recorded were earache and headache, with some mastoid tenderness. The auditory canal was wide and quite free throughout its length. At its fundus was seen and felt by probe an apparently cicatricial drum-membrane, quite free from congestion, greatly depressed, so as to be closely applied and seemingly fast adherent to the promontory, and imperforate throughout save for a circular opening about three millimetres in diameter, which was situated close to its upper and back border: through this opening projected a polyp small in size but about equal in diameter to the calibre of the perforation. A dose of calomel was ordered, the Bacon's artificial leech was applied, and frequent douching was advised. I deemed it probable, and so entered in the notes, that a mastoid operation would sooner or later become a necessity. On the 12th of March, four days later, I snared off a portion of the small polyp. During the interval which had elapsed since the preceding visit a striking change had occurred in the cicatricial or greatly distorted and depressed drum-membrane: it no longer lay lightly applied against the inner wall of the drum, save throughout a vertical line of persisting adhesion which ran down its centre dividing it into an anterior and a posterior half. These front and back halves of the membrane, instead of constituting parts of a common shallow concavity as before, were now converted into two sharply separated rounded

convexities prominent towards the eye of the observer. The whole appearance of the surface suggested, on a small scale, two slightly elevated mammæ with an intervening episternal surface. Under the probe these cushion-shaped prominences proved to be elastic and quite depressible: a Politzer inflation very markedly increased their convexity, thus demonstrating a fair degree of patency of the Eustachian tube and also that these rounded surfaces, while in shape simulating, were nevertheless in no true sense aural polyps. Their color, — nearly white, — and their manifestly dermoid covering also abundantly confirmed this diagnosis. An extension downwards over the promontory of the congestive process previously confined within the vault of the tympanum had lifted the depressed drum-membrane from its position of contact with the inner drum wall, and increased secretion, added to the sudden swelling of the mucous lining of the tympanum, had distended it and protruded it so far as the vertical band of firm and persisting adhesion would allow. I made an entry in the notes on this day to the effect that there was no redness or stenosis of the wall of the auditory canal. On March 15th, three days later, the two prominences had so increased and were so much more polypoidal in outline that by snare I succeeded in cutting off a portion of the posterior one of the two: nevertheless, to quote literally a note made on this occasion, it was "indisputable that the two prominences were thickenings of mucous membrane covered by cicatricial membrane and not true polyps." Three days afterwards, (March 18th) the auditory canal was for the first time found to be much stenosed. There was also swelling and great tenderness in front of the ear and some tenderness over the mastoid tip. The Bacon's artificial leech was therefore again applied, and very freely. Permit me at this point to call your attention to the evidence presented here, and, as I think, elsewhere in the

course of this patient's history, of a clinical phenomenon especially frequent of occurrence in cases of this kind. I refer to the great intolerance displayed by such cases to any operative interference short of such as will suffice to give prompt and free outlet to pent up secretion and greater room for expansion to swollen tissues confined within an unyielding bony envelope. The exacerbation of March 18th was very likely due to my inadequate interference of March 15th. On the other hand so great was the relief given by the very free leeching of March 18th that during the next month, viz., until April 19th, the patient did not find it necessary to report at the clinic. On April 19th I deemed it advisable again to snare the small polyp and noted that the two cushion-like and depressible prominences below it had further increased in convexity. On the 26th of April I made a paracentesis of the anterior one of these two sacs and found its wall to be fully one tenth of a millimeter thick. Bleeding was free, and, by May 1st, a large polyp had grown through the gap left by my incision. This new polyp I partially removed by snare, cauterizing the stump. Two days later, on May 3d, mastoid tenderness was again noted, although by no means extreme in degree, slight facial paresis was present, and the patient complained of very severe pain in the ear and head. There was, however, no recurrence of stenosis in the auditory canal. The discharge, — previously rather scanty, — had become quite profuse and evidently came for the most part through the original small circular perforation leading up to the vault of the tympanum or fornix tympani. Through this perforation still protruded the original polyp which had obstinately recurred, or rather obstinately grown, in spite of many snarings. In addition, however, to this polyp there were now present two others, decidedly larger in size, although less dense in consistence, the latter two having originated in that hypertrophy of the mucous mem-

brane of the lower tympanum which, prior to the paracentesis of April 26th, had remained shut in behind the curious pouting sacs already so often mentioned. The boundary lines of these three polyps were not very distinct, their recent rapid growth merging them, — the lower two especially, — into a common mass, and this mass completely filling the fundus of the auditory canal. Of this mass I removed by snare three large portions corresponding to the three component polyps, and I was much struck by the density of structure thus revealed. The tissue of the uppermost and smallest polyp was found to be almost cartilaginous in structure. I prescribed another dose of calomel, greater frequency in douching, the application of a poultice if found necessary, and directed the patient to report at my office on the following day, viz., Sunday, the 4th of May.

At this point in the history I crave the indulgence of the Society for a brief digression in order to comment upon a term which has been used several times in this paper. I refer to the expression "vault of the tympanum" or "fornix tympani," which I have chosen as a designation for that part of the drum-cavity lying above the upper border of the tympanic ring. This term is surely quite as appropriate as is the half-facetious, though conveniently brief, "attic", recently used by several well-known writers on otology. As to a supposed, and most erroneously supposed, Latin equivalent of the latter, viz., "atticus," I need hardly to add that it is of course totally inadmissible on linguistic grounds, there being no noun "atticus" in the Latin language save the adjectival substantive used to designate an Athenian citizen. "Atticus" is not, never was, and cannot now be made the Latin term for a garret, attic, or upper story of a house.

To return to the patient. The polyp evulsion of Saturday, May 3d, and the palliative measures then advised

proved inadequate to afford relief. Accordingly on May 4th I applied the Bacon's artificial leech, both before and behind the ear, abstracting a very considerable quantity of blood, and the next day, Monday, May 5th, I sent the patient to the New York Eye and Ear Infirmary and operated upon the mastoid, drilling through extremely dense bone to a measured depth of twenty-four millimetres, but finding neither an accumulation of pus nor any trace of an antrum. Well grounded confidence in the anatomical correctness of the direction pursued, knowledge of the fact that in such a case of sclerosis as I had believed this one to be the mastoid process was likely to be greater than common in bulk as well as denser than usual in structure, and the very urgent necessity for reaching the centre of disease, were my reasons for penetrating to so considerable a depth. The instruments used were the two sizes of Buck's drill, the larger seven millimetres, the smaller five millimetres in width. From the fundus of the auditory canal I also removed a number of polyp fragments, using for this purpose a narrow bladed but strong knife, a snare, and a pair of Politzer's polyp forceps. The knife point was kept in contact with the promontory while I caused the blade to describe a circle of such diameter as to clear out, as far as possible with the instruments at my command, all remaining portions of the polyps and also all or most of the thick and pus-confining membrane. The supra-mastoid integuments were found to be in every way normal and not in the least degree thickened, despite the severe deep-seated inflammation; that is, there was not the slightest evidence of supra-mastoid periostitis. The patient's temperature, taken in the mouth immediately before the operation, was 99.4° F. During the next four days it never rose above 100° F. and was generally lower than that figure. The man slept fairly well during the night following the operation and was free from headache

on the next day. The wound was dressed daily and the ear was douched as often as the necessities of the case seemed to demand, four such douchings daily being the number I at first prescribed. At the time of the operation and at every subsequent dressing of the wound, the bone sinus was syringed with an antiseptic solution of bichloride. Detailed notes of the four days following the operation it is not important to give. Suffice it to say that despite the fact that in my deep drilling I must have penetrated the petrous portion of the temporal bone, and had almost certainly injured the external semi-circular canal, no symptoms pointing to such injury were manifested. To its very bottom all parts of the drill-hole were distinctly visible under the use of head mirror and reflected light, and were thus repeatedly examined by electric light and by sun light during the operation, and again by candle light on May 7th and May 9th, and on each of these occasions two small openings closely resembling cross-sections of a semicircular canal were noticed on the posterior aspect of its fundus. Until May 9th, when beginning granulations were found just within the mouth of the bone sinus, the clean, white, and dense walls of this sinus suggested a drill-hole in a granite rock rather than an opening into the bone of a living man. Strange to say, no stenosis of the auditory canal took place after the operation, so that up to the very day of the patient's death, which occurred nine days after this first operation and two days after a second one presently to be mentioned, the fundus canalis was distinctly and easily visible. Although during these first four days the man seemed to be steadily, though slowly, improving, complaining of no headache, having no fever, eating quite well, and anxiously inquiring as to how soon I would permit him to sit up; nevertheless the persistence of *earache* and a tendency to renewed growth of the polypoidal mass gave me ground to fear that without

a further and a successful attempt to lay bare the centre of inflammation the patient might not recover.

On May 10th the disease took a most unfavorable turn. In the morning of that day the mouth temperature had been only 99.6° F., but in the afternoon it rose to 104.2° F., with relatively slow pulse rate. — 100 to the minute. — and the patient complained of violent headache. There was no delirium and no photophobia. The house surgeon, ascertaining that despite a daily dose of Hunyadi Janos water no action of the bowels had been had since the morning of Wednesday, the 8th, and that action the result of a dose of calomel prescribed on the 7th, gave calomel again and sent for me. The messenger going astray, I was not informed of the man's changed condition until the forenoon of Sunday, the 11th. Visiting the Infirmary at noon I learned that the morning temperature, after an action of the bowels, had fallen to 102° F.; yet it had again risen, being 104.4° F. at the time of my visit, and the violent headache persisted, although still without delirium. The pain in the ear had disappeared. At 10 P. M. I again visited the Infirmary. The temperature was then 104.2° F. The pupils were normal and an ophthalmoscopic examination, kindly made for me by Dr. James B. Gibson, the house surgeon (to whom as well as to his assistant, Dr. N. D. Harvey, I am much indebted for painstaking and skillful care of the patient), showed merely some retinal hyperæmia on the nasal side of the left eye and no nerve changes.

During the forenoon of the next day, Monday, May 12th, fifteen grains of quinine were given, but without appreciable effect upon the temperature. This step was taken experimentally on the chance of thereby proving the possible presence of a malarial or sewer-gas cause for the fever and headache. At 3 P. M. Dr. Albert H. Buck, as consulting surgeon to the Infirmary, and Dr. Robert

Abbe, acting by request for another consulting surgeon, Dr. Robert F. Weir, who by illness was prevented from coming, kindly saw the patient with me. The symptoms were practically unchanged, the man's temperature being still 104.2° F. The direction of the drill opening was pronounced to be as correct as I myself considered it, yet it was deemed wise to extend it slightly forwards towards the tympanum by the use of a Volckmann's spoon. The man being etherized, this was attempted, but without result, the hardness of the bone greatly hindering work close to the bottom of so deep and narrow a hole. Acccordingly, by chisels and a strong pair of rongeur forceps, the mastoid opening was enlarged until it became a funnel measuring twenty-seven millimetres in depth, about twenty-seven by twenty millimetres in width at its mouth, and seven millimetres in width at its inner end or bottom; in other words, the greater part of the mastoid process was removed, including the outer portion of the back wall of the auditory canal: yet no antrum was discovered, no recognizable drum cavity was opened, and no accumulation of pus was tapped. Toward the tip of the mastoid the deeper lying portion of the bone was softer than elsewhere, was diploetic in structure, and bled freely under the chisel; yet even in this region no cellular space existed of greater maximum diameter than one and a half millimetres, while the average diameter of the cells was but a fraction of a millimetre. Examination of two of the larger chips removed from this part of the bone showed a complete filling of all cellular spaces by intensely hyperæmic vascular tissue. The outer table of the bone, to the depth of fully a quarter of an inch, was as compact as the handle of a tooth-brush, while the inner end of the opening in both operations was found to lie in a structure of even greater density. At the conclusion of this second unsuccessful attempt to tap the tympanum, during the whole of which Dr. Abbe was

present and in part of which he kindly bore a hand, I again removed the recurrent polypoidal masses from the fundus of the auditory canal, using the Volckmann's spoon, as well as the snare.

On the day following, muttering delirium set in with diplopia from paralysis of the left external rectus muscle. There were some slight convulsive movements of the orbital and facial muscles, complete ptosis of the left eyelid, a convulsive extension of both arms at the time of the morning dressing, and persistent tonic contraction of the neck muscles on the right side. The temperature continued high. There was no distinct evidence of paresis of any of the limbs, no chill, no sweat, and no aphasia. An examination of the urine — which had to be drawn by catheter — showed no presence therein of sugar or albumen and a specific gravity of 1020. Dr. Abbe saw the patient with me again at 9 P. M. The temperature was then 104° F. Antipyrine was ordered in five grain doses. During the ensuing night the patient's wife, who sat by his bedside, noticed the occurrence on several occasions of what she took to be a distinct chill, followed by very profuse sweating. These chills may have been convulsions and this sweating may have been induced by the antipyrine. Some fluctuation of temperature was noticed. Thus from 103.8° F. at midnight it fell to 101.2° F. at 6 o'clock in the morning, rose one degree during the next four hours, and fell eight-tenths of a degree during the five hours following. No further sweating or supposed chills were observed; the pulse became very small and rapid, and the man died at 4.30 P. M. At 3 P. M. I dressed the wound and examined the ear. At the fundus of the auditory canal there lay a scanty, thick, grayish, and foul smelling discharge. The polypoid growth had not recurred. I passed a bent probe through the circular perforation formerly occupied by the original polyp and

detected a small loose fragment of bone within the tympanic vault.

The man unquestionably died of a diffuse meningitis, and, although positive evidence of such a fact was lacking, it is nevertheless not improbable that he had in addition an intra-cranial abscess, either extra-dural or within the brain substance. No post-mortem examination was permitted, despite urgent entreaty on my own part and that of the house surgeon.

Whether at any time subsequent to his return to the Vanderbilt Clinic in March last, a mastoid operation would have saved this patient's life may well be doubted. In view of the extraordinary conditions revealed by the operations of May 5th and May 12th, it is possible that an early and thorough removal of all polypoidal growths, of the cicatricial or distorted drum-membrane in toto, and of any remaining portions of the ossicula auditus, might have better accomplished this result: but a claim that it would certainly have done so will appear rash and absurd in the eyes of any man familiar with the anatomy and pathology of the tympanum and its annexes.

REPORT OF A CASE IN WHICH A SEPTUM, CLOSELY RESEMBLING THE TYMPANAL MEMBRANE, FORMED IN THE MIDDLE THIRD OF THE EXTERNAL AUDITORY CANAL, AND WAS REMOVED WITH IMPROVEMENT TO HEARING.

By Samuel Theobald, M. D., *Baltimore, Md.*

Mrs. M., aged 39, gave a history of deafness of long standing, which had been preceded in childhood by a discharge from each ear. She also stated that a piece of dead bone had come out of, or been removed from, the right ear. The left ear showed, upon examination, nothing remarkable — only the dull and somewhat depressed tympanal membrane characteristic of chronic middle ear catarrh. In the right ear, however, there was present a septum which, in its thickness, semi-transparency, and metallic reflex, closely resembled the tympanal membrane. It showed no evidence of being connected with the malleus, however: did not present the in-drawn appearance of the normal membrane: and was about 6 mm. nearer the outer orifice of the ear than was the opposite drumhead, being but 25 mm. from the level of the tragus. It moved out freely when the patient practiced the Valsalva method of inflation, and moved in again during the act of swallowing. Its presence had been discovered some months previously by the patient herself, who had been in the habit of touching the surface of the membrane with the head of a pin. She was also in the habit of practicing the inflation of the ears by Valsalva's method, thinking that this somewhat improved her hearing, and she had

no recollection of ever having produced a "perforation sound" (with which I afterwards made her familiar) by this procedure. She had chronic nasal catarrh, and, besides the great impairment of hearing, suffered with annoying tinnitus. The hearing was as follows: L. ear, watch, light contact; words, loud voice, 20′. R. ear, watch, close contact; words, loud voice, 20′.

It seemed to me more than probable that the septum in the right ear was acting as an obstruction, rather than as an aid to hearing, and at the patient's second visit I proposed its removal, stating, at the same time, that this procedure might be followed by a return of the old discharge. The patient's consent was readily obtained, and, as a preliminary step to its removal, I punctured the central portion of the membrane with a paracentesis needle. This at once gave, with Valsalva, a free, dry, perforation sound, which was quite startling to the patient, and showed that the tympanal cavity had been opened. The small incision thus made was then extended vertically, until it reached from the upper to the lower margin of the membrane. It gaped open widely, and a few radial cuts into the lateral portions of the membrane, which were attended by very slight hemorrhage, caused the whole septum to disappear, and exposed to plain view the tympanal cavity. The walls of the latter were dry and whitish, presenting the appearance which is usually found in an ear that has been cured of otorrhœa, but in which the drum-membrane is extensively destroyed. The stapes was easily seen in position, and the malleus was recognized, its handle being drawn strongly inward and forward, and it was evident that there had been no connection between these and the membrane which I had removed. Of the true tympanal membrane, there was practically nothing left.

The immediate effect of the operation was to improve

markedly the hearing of this ear. The watch, which previously was heard only on close contact, was now heard at $\frac{1}{4}''$: and words, which before could be distinguished only in a loud voice at 20′, were now heard very much better, some even being distinguished, at the same distance, in a low tone of voice. The patient was directed to wear a plug of cotton in this ear and to continue the treatment which had been prescribed at her previous visit: muriate of ammonia internally and the use of a gargle containing iodide of potassium and tincture of iodine.

Four days later the membrane showed some evidence of re-formation, and I touched the remains of it, which were now more conspicuous, with chromic acid: and, after syringing this out, applied powdered boracic acid. Three days after this, there having been some discharge from the ear meantime, I cut away all remains of the membrane with a secondary cataract knife, and applied boracic acid and a borated cotton plug. After this the patient missed seeing me for eight days, and the ear was discharging quite freely at the end of this time. The discharge, however, was easily arrested by boracic acid. The hearing during this period had been very much better than before the removal of the septum, though not quite as good as before the appearance of the discharge.

It seemed to me that this was a suitable case for an artificial drum-membrane, and I, therefore, inserted the ordinary cotton pledget moistened with glycerine and water. The improvement in hearing from this was marked, the patient being able to distinguish many words in a whisper, as well as in a low voice, at 20′. Subsequently an instrument for inserting the cotton drumhead was furnished the patient and, without much difficulty, she was taught how to use it. The solution first prescribed for moistening the cotton pledget (acid. boracic. gr. xv, glycerine ℥iij. aq. destill. ℥vj) seemed to promote discharge

from the ear, and an ointment of boracic acid and vaseline (ʒss to ℥ss) was substituted with advantage.

When the patient was last seen (Feb. 11, 1890) the cotton pledget was being worn with much satisfaction, enabling her with the right ear to distinguish words in a low voice and whisper at 20′, while with the left ear, as at first, she could distinguish them only in a loud voice at 20′.

There was no external discharge, though the walls of the tympanal cavity were now moist and red. To prevent a return of the otorrhœa a fifteen grain solution of boracic acid was prescribed with which to syringe the ear as frequently as might be found necessary: and, as the excised membrane showed some disposition to re-form again, the patient was directed to prevent this by plugging the auditory canal every night with cotton.

With the view of making the history of the case more complete, I have recently written to the patient, who lives in Georgia, asking for information as to the present condition of the ear, but I regret to say that I have as yet received no reply to my inquiries.

DISCUSSION.

The President, Dr. O. D. Pomeroy: — These membranes forming in the external canal have for their end, in the long run, a reparative action. The explanation of these has frequently been made that they are the result of a former suppurative otitis, which may or may not have involved the canal. I recently had an experience illustrating how these membranes may form. The patient, a woman, had had otorrhœa, with loss of most of the drum-membrane, for fifteen years. There was nothing unusual about the case. Under treatment there was complete cessation of the discharge in about two months, but the cure was brought about by the formation of a new

membrane similar to that described by Dr. Theobald, with the exception that it was thicker. I noticed that as the patient convalesced, the canal near the drum-membrane became narrower and narrower until the opening was no larger than a pin's diameter and it ultimately closed completely. I consider that a most satisfactory reparative condition. I think that the drum-membrane should be regarded as a protection to the drum cavity, and Dr. Theobald may find that it was a misfortune to have removed it. He is to be congratulated on his success in keeping the canal open. This is often a difficult matter. I did not hear whether or not she was entirely free from discharge. I should like to see this case followed up for some time in order to see if there were any return of the otorrhœa.

Dr. Samuel Theobald: — The patient did not remain under observation very long. In the course of a few weeks she returned to Georgia. There was at that time no otorrhœa. I consider the change in the lining membrane of the tympanic cavity a favorable one. Before the operation it was sclerotic, dry and white, more like a true periosteal membrane. Afterwards, and partly as a result of the insertion of the artificial drum-membrane, it became moist and resumed its mucous membrane character, which served to improve the hearing. The patient would have been very willing to be more or less troubled with otorrhœa in order to gain the marked improvement in hearing which she did. Before the operation, she was very deaf. There was undoubtedly a tendency to the re-formation of the membrane, but by plugging the ear with cotton pledgets, this tendency, it seemed probable, could be overcome.

Dr. J. A. Andrews: — A few years ago, I reported a case similar to that of Dr. Theobald. It was of Dr. B., of Raleigh. The case was one of acute inflammation of the middle ear with mastoiditis, in which the abscess of the mastoid had made its way into the external auditory

canal, producing a large opening which I enlarged. The attack was followed by the formation of a septum in the external auditory canal, closing about three-fourths of the canal. This I split, and two years subsequently it had entirely disappeared, and the discharge ceased. I do not suppose that the membrane interfered materially with the hearing. There was, however, considerable lowering of the power of hearing on account of the inflammation of the middle ear.

Dr. Huntington Richards: — I recently saw a case in which there were two closures, one complete and the other partial. The complete closure was at nearly the normal distance from the meatus and was similar to the one reported by the president. There was in addition close to the meatus a diaphragmatic circle of cicatricial tissue, leaving an opening not more than three millimetres in diameter, through which I extracted a small plug of cerumen. I cut away the outside membrane, but hesitated about cutting through the other, as in one or two cases in which I have done this there was no evidence that the hearing was improved.

I am now treating a similar case where a ring of stenosing tissue is pretty close to the level of the tympanic ring. I have burned away the lower part of this stenosing ring in order to give exit to discharge dammed up by it, using acetic acid for this purpose. Further destruction of the cicatricial diaphragm I shall probably not attempt. I would suggest the use of glacial acetic acid as a caustic in these cases.

Dr. B. Alexander Randall: — Where the use of the artificial drum-membrane is entrusted to the patient, it seems well to follow the advice of Politzer, who recommends that the pellet of cotton be twisted out into a long tail. This is then saturated with collodion, which, becoming hard, affords a means of inserting the artificial drum without the use of any instrument.

ON THE RENEWED EMPLOYMENT OF THE NASAL DOUCHE AND KINDRED PROCEDURES.

By Albert H. Buck, M. D., *New York, N. Y.*

Several years ago Dr. Roosa, of this city, published an article in which he warned his medical brethren that the use of Weber's nasal douche could not be considered as an entirely harmless therapeutic procedure. He narrated a number of instances in which more or less serious inflammation of one or both middle ears had followed the use of the douche; and at a later date several other writers, myself among the number, reported many additional cases. It was observed also that other kindred procedures, like snuffing up fluids through the nasal passages, syringing these cavities either from in front or from behind, etc., were at times followed by the same aural inflammation. For a period of several years it seemed as if these warnings had been generally heeded, for, in my own practice at least, cases of inflammation of the middle ear following the use of some one of the procedures referred to above, became noticeably less frequent during this period. Now, however, the frequency of this class of cases is again decidedly on the increase. During the past winter and spring I have seen a larger number of them than at any previous period of my practice, and I thought it might not be amiss if I were to call attention once more to the harmful results which occasionally follow the use of the nasal douche and similar procedures.

As was also the case in former years, the favorite remedy in these recent cases seems to have been a weak solution of salt in water. In a few instances the resulting inflammation of the ear was very severe, but in the majority there was simply an increase of the subacute nasal and aural catarrh, for the relief of which the nasal douche or the snuffling method had been prescribed. In a small group of cases the aggravation of the aural symptoms seemed to owe its origin to the frequent use of Dobell's solution, in the form of a nasal spray.

The question, How frequently do these aural complications arise in cases in which such therapeutic methods are used? is one which I am unable to answer. In the first place, I never use these methods in my practice, and consequently I cannot say from personal experience how often the ear becomes involved; and when I ask my friends who devote their attention specially to nose and throat, and who are in the habit of prescribing the use of the douche, they uniformly answer that aural complications are exceedingly rare, — so rare, in fact, that they have no hesitation in continuing to use these methods and remedies. I am at a loss to know how to harmonize these favorable reports with the frequency with which such cases present themselves for treatment in my own practice.

The question which would most naturally be asked of me in connection with this matter is, What safer and yet equally efficient plan of treatment would you recommend to take the place of those which you characterize as objectionable? I reply that, except in a single particular, the objects sought to be obtained by these objectionable procedures may be equally well secured by the free use in the form of a spray of such fluid mixtures as

℞

Eucalyptol and oil of wintergreen, ...	each gr. j
Menthol, ...	gr. ij
Benzoinol, ...	ʒ ij

M

Or, if the patient dislikes an oily preparation, the following may be prescribed:

℞

Listerine,	one part.
Water,	three parts

M

In the presence of an accumulation of viscid mucus or of crusts, a stream of flowing water will doubtless be found a more effective cleansing agent than a stimulating spray: but it is only in this respect that I can perceive any superiority of the douche over the sprays formulated above. Furthermore, if the latter are used freely — that is, several times a day, and each time during the inhalation (by the patient) of a deep breath, with closed mouth — crusts and tough mucus will speedily cease to play a part in the therapeutic problem.

In not a single instance have I known the freest introduction of the mixtures named to be accompanied by unpleasant aural symptoms. The immediate effects are very gratifying to the patient, and in a brief time a permanent diminution of the nasal and naso-pharyngeal irritation can generally be noted. The use of sprays, however, must be looked upon only as a valuable method of supplementary treatment, and not as a therapeutic procedure of the first order. The removal of hypertrophied glandular tissue and the local application of silver nitrate are the only remedial measures that are at all worthy of being considered fundamentally curative of the conditions which usually lead the physician to prescribe the use of the nasal douche or one of its substitutes.

DISCUSSION.

Dr. Randall: — As to the matter of sprays, it should be noted that the solution should have very nearly the same specific gravity as the blood serum. This is important in all nasal troubles, even when the mucous membrane is in a very abnormal condition. This precaution lessens the tendency either to exosmosis or endosmosis. The listerine must have enough bicarbonate of soda or other salt added to it to raise its specific gravity to the proper height. As to the douche, it is now rarely advocated by any one except in atrophic cases. Those who have had considerable experience find that the atrophic cases are rarely followed by aural complications from its use. In one of the clinics of Philadelphia, where they have some six hundred nose and throat cases annually, I see at least a dozen cases of acute aural trouble following operative procedures in the nose. Those who do much operative work on the nose and use the douche to get rid of the blood have a number of cases of middle ear trouble.

Dr. F. W. Abbott: — If Dr. Buck were here, I would ask him if it were not possible that the increased number of ear cases that he has seen was a concomitant rather than the effect of the douche and to be accounted for as a result of the epidemic of la grippe that we have had. I have seen many more cases of acute middle ear trouble requiring operative procedure during the past year than before that time. These were cases that had been affected with the influenza and certain remedies were used, but I could not see that the remedies employed had anything to do with the causation of the trouble.

Dr. Richards: — I do not exactly know what period of time Dr. Buck covers by his term "recently," but I have no doubt that he made allowance for the effects of the grip.

I think that he intended to include several years. For two years past he has noticed, and in my clinics I also have found, that a good many cases have presented themselves in which, while it could not be stated positively that the ear trouble was the result of the use of the douche, yet it could be pretty safely assumed that such was the case.

In regard to what Dr. Randall has said, I would say that Dr. Buck prefers the oily spray. In one case of atrophic rhinitis seen by me at the Vanderbilt Clinic there was double otitis media from the start. I had to do a paracentesis and a Wilde's incision on one ear. The problem was to get the nose into shape so that I could use the Politzer's bag. I used a spray for a time and removed all the nasal crusts. I then gave her a spray to use at home. Under this treatment, superadded to simple nitrate of silver moppings of the pharynx vault, the throat and nose so far recovered that she had no occasion to consult a specialist in that line. The ears got completely well. In that case I think that the patient stated that a sharp pain in the ear had immediately followed blowing the nose.

Dr. Andrews:—In reference to one point raised by Dr. Randall, I would state that last summer a case was referred to me by Dr. Jarvis of New York, in which he had operated for stenosis of the nasal passages. The case was sent to me on account of suppuration in the middle ear. The operation on the stenosis was apparently successful, but there was a great deal of discharge from the nose and slight purulent discharge from the ear. The patient had been using the nasal douche for a long time with benefit. I advised that this be discontinued. At the next visit the patient was much worse and at the third visit she was so much worse that she preferred to return to the use of the douche and has been using it ever since. For myself, I never recommend the use of the douche.

Dr. Arthur Mathewson:—In the cases that I have

seen there has not been much doubt in regard to the cause of the ear trouble. The inflammation in the middle ear so immediately followed the use of the douche that the connection was quite clear.

Dr. Andrews: — I think that Dr. Roosa answered the question in regard to the connection between the use of the douche and middle ear disease in his reply to a laryngologist who stated that he had used the douche a great many times, but had never seen any trouble follow. Dr. Roosa said that the reason of this was probably that those cases which acquired ear disease as the result of the use of the douche consulted the aurist rather than the laryngologist.

The President: — The nasal douche question seems to me thoroughly settled. I think that the older aural surgeons are afraid of it.

A word in regard to the point that the ear may be damaged by operations upon the nose. Two years ago, at Albany, I said something with reference to the possibility of an otitis resulting from operations in the nasal cavity. Several eminent throat men proceeded in my direction in a hostile manner and I defended myself as well as I could. Since that time, I have seen so many instances of this kind of trouble that I am more and more confirmed in my opinion that it is hazardous to operate too freely in the nasal cavity. At the last meeting of the New York Laryngological Society there were a number of cases reported where the ear was damaged from somewhat violent operations in the nasal cavity.

ON THE REMOVAL OF A BULLET FROM THE EAR WITH THE ASSISTANCE OF THE GALVANO-CAUTERY.

By Lucien Howe, M. D., *Buffalo, N. Y.*

The difficulty often met with in removing a round, hard body from the deeper portions of the auditory canal is too well known to require any elaboration. Particles or substances which are much smaller than the diameter of the canal can easily be removed, either by syringing or with forceps, but every aurist has encountered cases where the foreign body, such as a bean, pea, seed, bead, or other substance just large enough to fill the canal, has been a source of pain to the patient, anxiety to the friends, and baffled almost every effort at its removal.

I desire in this short paper to call attention to a procedure which may prove of advantage in certain cases, and which, as far as I have been able to discover, has not been suggested before. This is the use of the galvano-cautery for the removal of lead substances. A brief outline of a case in which it was of great assistance will best illustrate my meaning.

On the 30th of April, a boy, A. E., seven years old, was brought to me with a small bullet or large buckshot lodged in the lower part of the auditory canal. In childish fashion he had pressed this bullet into the outer ear, and, when an attempt was made to remove it, in his struggles he had pushed it far in until it rested on the tympanic membrane. A further attempt by syringing was first made, the head of the child being held lower than the body, but with no avail. A trial with the forceps showed

the foreign body to be so firmly imbedded that no effort would even stir it, and, above all, its smooth hard surface afforded no more point for holding it than if it had been made of glass. Although a pair of very fine toothed iris forceps were pressed very firmly into the small portion of the bullet presenting, they slipped off invariably, without moving it in the least. Here was a condition of affairs not easy to deal with. On looking up the literature of the subject no suggestion could be found, unless it were in a hint from Löwenberg. He once succeeded in removing a small ivory ball such as formed the tip of a pen holder, by saturating a camel's hair brush with glue, pressing this upon the ball, and after sufficient adhesion took place, it was possible to extract the ivory. In the instance I cite, however, there was nothing which could be found either to adhere to the bullet or facilitate a grasp upon its rounded surface. It seemed to me, however, that it might be possible to melt into the bullet the wire of a galvanocautery, by means of which, when cool, it could be drawn out, or, if not, at least to so roughen the surface of the lead as to allow a suitable pair of forceps to grasp it firmly. Both of these results were ultimately accomplished,—the former less satisfactorily than the latter.

It was easy enough to make a cautery which theoretically would answer this purpose, but on experimenting with bullets of a similar size, it was found that no small amount of care was necessary to make the platinum wire of just the right size in proportion to the small copper wire. After several trials, however, a cautery was finally made which could be melted into a similar bullet and especially to do that quickly enough not to liquefy the remainder of the lead.

Accordingly, on the second of May, chloroform was administered to the patient, and the cautery was applied to the bullet, but a practical difficulty at once presented

itself: for when the heat at the point of contact was so great as to melt the lead, it was found that a sufficient degree of heat was also conducted from the bullet as considerably to endanger the surrounding tissues.

In a few seconds the wire was melted into the bullet so firmly that, when cooled, the two became adherent and in spite of resistance offered the latter could be drawn from its position nearer the smaller portion of the canal. Here, however, it became detached.

Instead of heating it more than necessary, the cautery was touched to the lead above and below, roughening its otherwise smooth surface. This gave two opposing points against which it was possible to apply a pair of toothed forceps, and, making firm traction, the bullet was removed. For almost two weeks afterward a slight discharge persisted, and as this subsided under the usual treatment there remained a perforation about 2–3 mm. in diameter, near the extremity of the handle of the hammer, but in spite of that the hearing distance with watch is greater than two-thirds normal, and there is practically no difficulty in conversation. In referring to this procedure I appreciate that it is not at all surprising that the galvano-cautery should suggest itself in such a connection, but by reporting the case an opportunity is at least offered to express my belief that we should use every effort to discourage the practice common among physicians of attacking at once every such foreign substance with a pair of forceps. By our own examples and by papers or discussions at meetings we should teach our fellow practitioners to whom these cases first apply, how much simpler and safer instrument we have ordinarily in the syringe. In this way the proportion of cases could be much lessened which require the galvano-cautery or any similar appliances for removing foreign bodies from the deeper portions of the external auditory canal.

DISCUSSION.

Dr. Chas. E. Rider :—I would ask whether in this case the bullet was pushed down by the patient or by the efforts at removal? In all the cases that I have seen the foreign body has been forced down by the efforts of the general practitioner to remove it. I think that the suggestion of Dr. Howe, that the general practitioner be advised in these cases, as they were formerly advised in cases of purulent ophthalmia of infants, not to resort to the use of instruments such as probes, hooks, etc., for the removal of foreign bodies, is a good one.

Dr. R. A. Reeve :—I think that it is desirable to employ as simple means as possible for the removal of foreign bodies. I have never failed in the removal of foreign bodies by the use of a little attachment found in the Politzer pocket case. One end of the steel probe is thin and flat and bent at an angle with the shaft. This could be slipped over the foreign body and in a piece of lead would sink in sufficient to give the necessary purchase. I have found this to always answer the purpose, and it would be a simpler means than the galvano-cautery.

Dr. Theobald :—If the foreign body is of a round shape, the forceps are badly adapted for its removal. They can not be opened sufficiently to grasp the body. On the other hand, the use of the hook is almost always successful. So far, I have not encountered a foreign body which I have not been able to extract at one sitting. I have removed many foreign bodies by a contrivance made out of a fine English hair pin. These hair pins are made of steel and are stiff. I file one end down to a flattened point and serrate it on its under surface and then bend it at an obtuse angle. I have found this contrivance extremely valuable. It will remove any foreign body not so tightly wedged that the stiffness of the instrument is not sufficient to accomplish its extraction.

Dr. Mathewson: — I have found the little spoon, or curette, which is seen in every eye case, to work very well. The sharp edges coming in contact with the foreign body hold. It works satisfactorily even where the body is tightly impacted.

Dr. Randall: — I may say that I have used the spoon of the Politzer ear case. It is almost hemispherical and I have found it to take good hold of any substance like lead. I have thus far failed in only one case to remove a foreign body from the ear. This was a case of a pebble in the tympanic cavity, which had been worked at for some time. I etherized and could get sufficient hold of it to lift the child's head from the table, but I could not dislodge the body. Although I failed to remove the body, there was almost no increase of suppuration as a result of the manipulation, but I had no second opportunity to try extraction.

Dr. Rider: — The matter of a pebble in the tympanic cavity has been referred to. I could mention a similar case in which a pebble had been pushed down the extremity of the external auditory canal by a general practitioner. I have never seen a body so deep in the canal put there by the patient. The boy was ten years of age and came from a distant town. I gave ether and tried to remove it but failed and then sent for Dr. E. M. Moore. I then took a dentist's broach, made of the best steel. I heated it and bent a hook on it. This I straightened out by a fair pull on the pebble. It was only by repeated efforts and by working for an hour that I succeeded in getting it out. I took the pebble and put it into the canal of a cleaned skull and there was only one position of the pebble in which it could be removed. I have had one similar case since, and I have found that the dentist's broach, bent at the proper angle, makes the best instrument for the removal of these bodies.

Dr. Read J. McKay:—I have been listening to the various means proposed. For myself, I usually rely on the bent hook. Years ago, I had a pebble case which had been worked at by several doctors. I was able to catch the pebble with small bullet forceps, which have pointed ends. This was the only way in which I could catch the pebble. Since then I have always kept these forceps convenient for use in a similar emergency. I think that it would have answered in the case described by Dr. Howe.

Dr. J. A. Lippincott:—In addition to the hooks described, I have derived great assistance from a loop of steel wire, especially in extracting smooth bodies like pebbles. The important point of the paper is, however, that referred to by Dr. Howe: the abuse of these and similar instrumental means by the general practitioner. This was forcibly impressed upon me by a case brought to my office some months ago, in which the whole of the middle ear had been cleaned out. There was no membrana tympani, and, it may be added, no ossicles, no foreign body.

Dr. Richards:—There is only one instrument that the general practitioner ought to use in the removal of a foreign body, and that is the syringe. With that he can generally remove the body, and can do no harm. In the early days of the Vanderbilt Clinic a case came to the aural department, after having been to another department. I saw the patient by accident the day following admission. I looked at the ear and supposed that I had to do with wax, but the syringe brought away a bit of the skin of a brown onion. I was informed that the ear had been poked at and irritated by a prominent general practitioner, in the presence of a small class of students, or of his clinical assistants: that no head mirror was used, that the child had screamed with pain, and that finally the mother had been directed to bring her back the next day

to be syringed, but had not been referred to the aural department.

After removal of the onion skin the wall of the auditory canal close to the drum-membrane was seen to be covered by several ecchymotic blebs. The patient not reporting to me as directed on the next day, I went to her house, found her with good hearing, and was told she had suffered no more pain or discomfort in the ear.

Dr. Howe: — I wish it to be understood that I did not intend to bring up the question of the removal of foreign bodies, as ordinarily presented, where there is comparatively little difficulty in removal. I think that we all have a collection of these bodies, some of which are easily removed, and some with considerable difficulty. I thought that this case was worthy of reporting, because in certain cases extreme difficulty does arise. This is not my experience only, and if a man with the experience also of Dr. Buck, finds it necessary to dissect off the back part of the ear and bring it forward, it seems that there are cases which do not readily yield to treatment, and even when they do, we do not see the bad results that follow. In many of these cases which come to the clinic, while we may not clean out the entire middle ear, we do find a certain amount of injury which has been done by the violence which we ourselves inflict.

Dr. Andrews: — I am of the opinion that the late Dr. Edward T. Ely, of New York, was the first to perform partial detachment of the auricle for the removal of a foreign body from the external auditory canal.

MASTOIDITIS INTERNA PURULENTA FOLLOWING ERYSIPELAS.

By J. A. Lippincott, M. D., *Pittsburg, Pa.*

The following case, specially interesting from an etiological standpoint, presents some additional features which help to make it worthy of being placed on record.

E. S., æt. 28, had always enjoyed excellent health, and, in particular, had never suffered from any aural affection, his hearing on both sides having been, indeed, exceptionally acute.

He was attacked on March 27, 1890, with erysipelas of the face and scalp, producing great tumefaction. Ten days later two large abscesses, one below the left eye and the other above the occiput, were evacuated with the bistoury. The swelling and the discharge of pus gradually subsided during the next four weeks.

One week after the beginning of the attack, without previous pain or special local swelling, and without any trouble in the throat or nose, pus began to flow from the right ear. His medical attendant, Dr. McCormick, of Greensburgh, an intelligent physician, states that at this time the walls of the external auditory canal were normal, and that the pus obviously came from the middle ear through an opening in the drumhead. About May 15 (the otorrhœa in the meantime continuing) the neighborhood of the ear became swollen and extremely painful. Under hot poulticing these symptoms yielded in about a week. On June 22d the pain and the swelling recurred, and continued until I saw him, June 29th, when the condition was as follows:

Decided swelling and tenderness over whole mastoid region, on right side. Doubtful fluctuation in upper mastoid region. External auditory canal filled with pus, on removing which, at a point about two-thirds of its depth from the external meatus, was seen a furuncular looking mass with its base attached to the posterior wall and large enough to render a view of the M. T. impossible. Pus was, however, seen coming from behind this mass, but apparently very little from the mass itself.

A watch of forty inches hearing distance was heard on light pressure. Examination of the throat and nares negative. The patient complained of deep-seated pain behind the ear. He was considerably emaciated.

I advised an operation on the mastoid as the speediest way of securing thorough drainage and consequent relief.

Two days later Mr. S. returned to the city and went to the hospital, where an anæsthetic was administered and the mastoid perforated in the usual way. A small collection of pus was found under the periosteum at a point about three-fourths of an inch above the superior wall of the meatus externus: but neither there nor at any other place could any trace be found of an opening into the mastoid cells.

On perforating the external wall, which was thin, the cells were found extensively broken down, the cavity thus formed being filled with a very greenish, unhealthy looking pus which reminded me strongly of the appearance of the pus removed some years ago from an orbital abscess following erysipelas. A warm solution of boric acid, thrown with a syringe into the opening, escaped through the auditory canal. The syringe was subsequently used daily, but no pus afterwards issued either from the mastoid opening or from the meatus. All the unpleasant symptoms were promptly terminated by the operation. On the fourth day the protrusion from the posterior wall of the

canal had almost disappeared and the M. T. could be easily examined. A perforation in the centre of the latter was seen about 3 millimeters in diameter, from which, by means of the cotton probe, a very minute trace of pus was removed.

The hearing on the fifth day had improved so that the watch could be heard at 2 inches. Patient went home in a week with the suggestion to Dr. McCormick to continue the irrigation and to keep the wound open as long as might seem necessary.

Erysipelas as a cause of mastoiditis interna must be rare. In the limited period which has since elapsed I have not been able to find a report of any case arising in this way.

The sequence of the pathological phenomena is not without interest, nor, it may be added, without uncertainty. The mastoid disease may have been metastatic in character, and so, in a sense, primary. The history of the case before I saw it, however, perhaps tends to show that the first link in the chain was a painless abscess in the middle ear. Then followed invasion of the mastoid cells, with violent symptoms, and final rupture through the posterior wall of the auditory canal, which gave temporary relief; finally, recurrence of the pain and swelling, probably from blocking up of the opening in the auditory canal.

DISCUSSION.

Dr. Randall: — I recently had under observation a case to which I shall refer. It was that of a young blacksmith who had injured his hand with a horse shoe and was under the care of a surgical friend. Without pain or any preceding deafness of which he was aware, he suddenly began to feel fullness in the right ear, and this was followed by a copious serous discharge. Within twelve hours he was sent to me. I found posteriorly

a bleb-like swelling which completely hid the drum-membrane. This was about the middle of the canal, and I was unable on evacuating it, to push it aside so as to see the condition of affairs. I thought that it was a case of ordinary otitis media with this condition of the canal, and treated it expectantly. The next day he was decidedly worse, and unable to go out. I had noticed at the first visit a distinct increase of temperature of that cheek and side of the head. I went to see him and found the febrile movement higher and there was no question as regards the difference in temperature of the two sides of the head. There was no mastoid tenderness. I saw the patient that evening and it was clear that he had erysipelas. This lasted a month and he came out with the ear still discharging. I found quite a loss of bone on the posterior wall of the canal and there was a perforation either in the posterior upper part of the drum-membrane or in the bone at the margin. I could prove no communication between these two openings. The hearing has been good except when the swelling completely filled the canal. In that case the first symptoms noted by the patient and the copious serous discharge were followed within thirty-six hours by clear manifestations of erysipelas. I do not know that this has any true relation with the case which has been reported. In my case the patient's hand, which was considerably injured, did perfectly well and was not involved in the erysipelatous process, which involved, however, both sides of the head.

THE USE OF THE PAPER DISC: CASE HISTORIES.

By Robert Barclay, A. M., M. D., *St. Louis, Mo.*

The subject of methods and devices for promoting conservative structural modification in the aural apparatus seems to have ever been one of singular interest to the otologist. Of these ingenious therapeutic resources, the procedures against the membrana tympani, notably when perforated, seem specially momentous.

Without attempting a discussion of their respective merits or a recapitulation of the specific conditions in which each is claimed to be preferably indicated, it is desired to draw attention to one only: The application of paper dressings to the membrana tympani, first suggested by Dr. Clarence J. Blake, of Boston, for the treatment of perforations of that structure,[1] with the details of which method it is presumed that you are already familiar.

To demonstrate not only the advantages claimed for this method, but others, and its wider usefulness in other conditions than those defined for its application when originally suggested, the following selected case histories are here offered:

1. A lady, 28 years old, had quieted with morphine sulphate, self-prescribed, the pains of an acute otitis media, right side, which had existed for twenty-four hours.

[1] *Vid.* Report of the First Congress of the International Otological Society, New York, September, 1876, pp. 125–132.

Though the anodyne influence of the drug continued, the deafness and tinnitus were annoying.

On examination, the right membrana tympani vibrans was bulging greatly, and a separate sac seemed to have formed independently in the posterior-superior quadrant. A deep incision through each of these somewhat relieved the discomfort. The resulting otorrhœa was checked within five days, when a perforation of the posterior-superior quadrant of the membrana tympani which had persisted, was closed by application thereto of a paper disc, as recommended by Dr. Blake. Seven weeks afterward, the disc, with attached epithelial plate, was removed from the posterior-superior canal wall. The perforation had healed. The hearing was found normal.

II. A lady, 21 years old, in excellent general health, sought relief from tinnitus and deafness of the right ear, upon which ear she relied in hearkening, the left one having been condemned as irreparably disabled by former inflammation. Up to the age of eight years, she had had intermittent otorrhœa on both sides. Three years before the consultation she had a return of this trouble in the left ear, which was checked, after one week's treatment, by insufflation of powders. This ear, however, remained deaf, and in it, on exposure to cold, she at times had tinnitus and autophony. She could not hear a neighboring church bell, loudly heard by others: nor could she sustain a conversation across the room nor hear any one speaking in the next room with open door. With the right ear, she heard moderate voice; with the left, loud voice, — at two feet distance.

On examination, the right middle ear was found to be the seat of chronic catarrhal inflammation. The membrana tympani of the left or condemned ear was perforated in the posterior-inferior quadrant; the perforation, circular in form, extending almost to the umbo and annulus tendi-

nosus. Its edges were cicatricial and thickened: and the mucous membrane of the tympanum and other visible neighboring tissues were dry and glistening. Treatment somewhat relieved the symptoms of the right ear. Stimulating applications to the rim of the perforation of the left membrana tympani induced its closure to $\frac{1}{16}$ inch diameter, when a paper disc was applied to it. Two days afterward the disc was still in place. Hearing in the left ear at that time, for watch, $\frac{1}{48}$, while moderately loud voice could be heard at twenty-five feet distance. The disc was subsequently removed from the canal wall, the perforation having closed with new membrane. The hearing in the left ear has steadily and greatly improved, and she has since learned to depend upon it rather than upon that of the right, as formerly.

III. A man, 35 years old, had suffered two months before with great pain, deafness, and tinnitus of the left ear, and with a cough. The pain had been relieved, it was stated, by paracentesis of the membrana tympani. Marked deafness, tinnitus, cough, and otorrhœa had since persisted, though frequent and regular insufflation of boracic acid had been made.

On examination, the tissues of the left membrana tympani and canal were found somewhat macerated, inflamed, and bathed in mephitic pus. There were two circular perforations of the membrana tympani, both in the posterior segment of Kessel: one, $\frac{4}{32}$ inch in diameter, beneath the umbo, its greater portion in front of the vertical diameter of the membrane: the other, $\frac{3}{32}$ inch in diameter, near the posterior fold, midway between the manubrium and annulus tendinosus. There was rhinitis hypertrophica and dental caries and tartar.

The otorrhœa was checked within eight days, when a paper disc was applied to each perforation, with immediate improvement of hearing for the voice. The discs

were in place two days thereafter. the hearing having improved. It is thought that the relief may have been permanent, as the patient did not return.

IV. A man, 37 years of age, had, six weeks before, sustained a compound fracture of the skull, involving both sides of the base, the bony tympana, membranæ tympanorum, and right external auditory canal. The consequent phenomena, both local and constitutional, had been typical and striking.[1] Of these, as specially noteworthy, may be mentioned the strabismus, facial paralysis, deafness, and aural hemorrhage, followed by otorrhœa: these were bilateral.

On examination, after the pus had been removed, a transverse rent of the right membrane above the malleus, with oblique irregular fracture of the superior wall of the corresponding external auditory canal, and a wound of the anterior-superior and posterior-inferior quadrants of the left membrana tympani, were distinguishable.

Within thirty-five days, the only open wound visible was a small perforation of the anterior-superior quadrant of the left membrana tympani, which seemed persistent. A paper disc was applied to this, a little flexible collodion being afterward painted over it. He now heard ordinary voice in this ear at twenty-five feet distance, and within two weeks the hearing became normal. The paper disc was some time after found lying upon the floor of the external canal, having fallen from the overhanging wall whither it had been carried by the outgrowing epithelium. Two years later the newly formed membrane could not be distinguished as such.

V. A lady, 21 years of age, had a strong solution of lye "splashed into her eyes and ears" when she was three years old. This was followed by blindness for two

[1] *Vid.* Report of this case in "Facial Paralysis Associated with Ear Troubles," St. Louis Courier of Medicine, October, 1888, pp. 298–299.

months, and bilateral otorrhœa of longer duration. After this became no longer visible from without, she still suffered from earache at times. She began to experience slight deafness in the left ear five years previous to the consultation: this had been growing steadily worse and became quite annoying and very pronounced. No otorrhœa had been observed during those five years. Of late she had autophonous voice. Intense non-localized headache, sometimes persisting the entire day, troubled her greatly and frequently. The family history, in every direction, was one of tuberculosis.

Hearing: Right ear, normal for voice and whisper: for watch, $\frac{3}{4}\frac{4}{8}$. Left ear, loud voice at fifteen feet distance: for watch, $\frac{0}{4}\frac{}{8}$, even on pressure-contact. For tuning-fork: right ear, AC greater than BC; left ear, BC greater than AC.

On examination, there was found a thinned circular spot, $\frac{2}{3}$ inch in diameter, below the umbo of the right membrana tympani, which seemed to be a new membrane. The left membrana tympani had almost entirely sloughed away, leaving a perforation shaped like the heart of a playing card. The manubrium of the malleus was greatly retracted and the upper edge of the perforation formed on either side a bow over to its very tip. There was a perforation of the membrana flaccida through which the malleo-incudal joint was visible. The inner wall of the tympanum, pale and somewhat nodular, was covered with a gummy secretion. There was a slight swelling of the posterior canal wall just without the annulus tympanicus.

There were no severe nor frequent headaches after one week's treatment. Within three months the patient's weight increased by more than nine pounds. The hearing for watch in right ear became $\frac{3}{4}\frac{6}{8}$; with left ear it improved for the voice. A paper disc, $\frac{5}{16}$ inch in diameter, was

applied to the remains of the left membrana tympani. Within twenty days the watch could easily be heard off the left auricle, and a conversation in ordinary voice could be maintained at thirty feet distance by aid of this ear alone. There having been at no time since the disc was applied any untoward symptom, and the hearing having steadily improved, the patient was granted permission to visit a distant relative, with whom, without any aural discomfort, she has now been for more than four months.

VI. A man, 22 years of age, had an attack of scarlatina when a child, and afterward had prolonged intermittent otorrhœa, right side. For the previous three weeks he stated that he had suffered with "dumbness" and deafness of both ears, worse in the right, — which had followed a severe coryza. Hearing: Loud voice at fifteen feet distance: watch, $\frac{0}{48}$, with right ear. He said that he could not enter conversation at home on account of his deafness.

On examination: Left ear the seat of chronic catarrhal otitis media. Right ear shows the results of otitis media purulenta chronica: a perforation of the anterior-inferior quadrant of the membrana vibrans, and one of the membrana flaccida. The anterior-inferior quadrant here is entirely inflamed, bulging, and macerated. Dimensions of perforation not clearly made out in consequence.

Seven weeks' treatment induced closure of both perforations. The anterior-inferior quadrant of the right drumhead, however, was one large circular manometric membrane, evidently as result of former attacks of suppuration. Hearing distance for watch, $\frac{1}{48}$: after Politzer inflation, $\frac{5}{48}$. A paper disc slightly larger than the manometric membrane was then applied, concentrically, to it, and gentle Politzer inflation made. Hearing for watch, $^{6}\frac{1}{48}$. The disc has been once renewed and removed. Twenty days later the hearing for watch was $\frac{4}{48}$, uninflated

tympanum. The patient, one month later, informed me that his hearing was far better than before his last aural sickness; and it has since remained so.

VII. A youth, 19 years old, had been since the age of six months subject to bilateral otorrhœa, with occasional intermissions of two years. The right ear had been discharging for the preceding nine months, having been "gathering" painfully for two weeks before it "broke." There had been a similar attack of the right ear one year before that. There was tinnitus in both ears, more decided and constant in the right one. This one felt plugged, and was painful on awakening in the morning. The deafness had been increasing, until it became annoying. There was rhinitis hypertrophica and slightly enlarged tonsils. The lower bicuspid teeth, both sides, were carious to mere shells.

After removal of pus from the *cul-de-sac* of the right canal, a perforation of the anterior-inferior quadrant of the membrana tympani near the umbo was distinguishable.

Six weeks later, the otorrhœa having almost entirely ceased, a paper disc was applied to the perforation. Hearing with this ear was now for the watch, $\frac{1}{4}\frac{2}{8}$; and low whisper and lowest voice were heard at three feet distance. The perforation promptly closed and the hearing subsequently improved.

VIII. A youth, 19 years old, when a child, had measles, followed by earache and otorrhœa. For the last eight years, during spring and autumn, he had a recurrence of otorrhœa on the left side. When the left ear was for the first time affected, and again several years thereafter, the right ear also discharged. The last recurrence, of one week's standing, began with earache, after picking "some thickened, hard substance" from the left ear for the relief of "a queer sensation in it, when he awoke one morning." To retain his mercantile position, it was necessary for him

to be able to use a telephone for the reception of orders: this he was no longer able to do with the left ear, in which also he had roaring tinnitus and autophony. There were pains in the top, front, and left side of the head. He was subject to "colds in the head," and had hypertrophic rhinitis.

On examination, the left membrana tympani was found greatly thickened, and perforated for about $\frac{1}{4}$ inch diameter behind and on a level with the umbo. It was of a yellowish color, except along the manubrium mallei and periphery, where the blood vessels were greatly engorged. There was a profuse secretion of healthy looking pus.

After nine days' treatment the discharge ceased, and the perforation became a trifle smaller, closing from the manubrial side. The edges were stimulated with solution of nitrate of silver and cotton-wool pellets worn in the perforation until the fourth week, when the first paper disc was applied. Twenty days later this was removed and a much smaller one substituted, the perforation having greatly diminished. Four days later the hearing of this ear for watch was $\frac{3}{4}\frac{0}{8}$. The disc having later become displaced by epithelial growth, and the perforation having not contracted, the former method of stimulation was resumed. In the eighth month the perforation closed: when, after being so one week, hearing was found to be in this ear, for watch, $\frac{3}{4}\frac{6}{8}$, and lowest voice and whisper were heard at twenty-five feet distance. He could now use a telephone satisfactorily. The hearing of the right ear was normal. The membrane has since remained closed, has gradually cleared up, and grown steadily stronger. It is now ten months since the perforation closed, and the hearing in the affected ear for watch is $\frac{4}{4}\frac{0}{8}$: low voice and ordinary whisper heard at forty-five feet. Tuning-fork shows, BC smaller than AC, both ears; BC left ear smaller than right ear. H. D. w. Rt., $\frac{2}{4}\frac{4}{8}$.

XV. A physician, 48 years old, who, thirty-four years before, had in diving sustained a rupture of the membranæ tympanorum, had, in consequence, for over thirty years, intermittent otorrhœa, both sides.

For many years he had worn in both ears the artificial drumhead of cotton-wool saturated with glycerine and water, or water alone: without this aid he affirmed that he was almost totally deaf for ordinary sounds.

At the first examination no normal landmarks of the membrana tympani could be distinguished, the *cul-de-sac* of the canal and the membrana tympani forming a cup-shaped end to the canal of both ears. The tissue of this cup-shaped end was macerated and dermoid in appearance. After several days' non-interference, a perforation of the posterior-inferior quadrant of the right membrana tympani was made out, which was then closed with a paper disc and promptly healed. Seven weeks later the hearing for watch was $\frac{4}{48}$. The hearing for voice, which was then fair, subsequently greatly improved.

The left membrana tympani was recently found with a bulging sac containing fluid, most prominent at the posterior-inferior quadrant. A long incision of this, with subsequent removal by syringing of much tenacious and cholesteatomatous matter, has given the patient, since the wound healed, almost equally as good hearing in this ear, without the inconvenience and danger attending the constant wearing of the cotton-wool artificial drumhead.

Conclusion. — From these case histories may it not be considered demonstrated that the paper dressing has these therapeutic advantages already claimed? Applied to a perforation of the membrana tympani, it performs, in a great measure, the functions of the lost membrane, (1) improving the hearing from the time of application, (2) maintaining a normal degree of moisture and temperature in the air of the tympanic cavity, (3) protecting the enclosed

tissues from direct exposure to atmospheric influences, and (4) excluding organic and inorganic foreign bodies approaching from the external auditory canal. It (5) acts also as a local irritant to the edge of the perforation only, thereby inducing reproduction of the lost membrane: (6) as a splint, protecting it when forming, and preventing its displacement in either direction and consequent alteration of tension and curvature, by disturbances of the equilibrium of atmospheric pressure on its surfaces.

But may we not, in deduction, accredit this method with these additional advantages heretofore unclaimed, moderately stated as follows: (1) Improvement in hearing may subsequently result from cicatricial closure of the perforation of the membrana tympani not at once appreciable on application of the paper disc: (2) the paper dressing may prove serviceable even where the perforation is quite large: (3) it may be used to advantage where indeed the outer surface of the membrana tympani has not yet returned to its normal condition: (4) it may prove a serviceable artificial membrana tympani where that structure is almost entirely lost, and, at the same time, may stimulate reproduction thereof: (5) it may serve as a splint when applied to manometric tissue, may induce conservative structural modification thereof, and may, by acting here as an artificial membrana tympani, at the same time improve the hearing.

A failure to secure satisfactory results is not to be attributed to the method, experience proving that discrimination, judgment, and skill in its application are largely essential to its usefulness.

A REVISED DESCRIPTION OF THE ANATOMY OF THE ELEPHANT'S EAR.

By Albert H. Buck, M. D., *New York, N. Y.*

The discovery made by Dr. Richards,[1] that the plane of section, which I had taken to be a horizontal plane, was in reality vertical, renders a large part of the description which I published in the Transactions of 1888 inaccurate. The restrictions under which I was placed by Prof. Wilder, who desired to preserve the specimen in as perfect a condition as possible for the Cornell Museum of Anatomy, rendered it an easy matter to be misled in regard to the true relations of these different sawed surfaces, to a vertical antero-posterior and a vertical transverse plane, and this must serve as my apology for the error which I was so unfortunate as to make. Thanks to the removal of these restrictions at a later date by Prof. Wilder, my colleague has been enabled to study the specimen more thoroughly than I could, and he has determined accurately the relations of these different parts. With the Society's permission, therefore, I submit herewith, for publication in this year's volume of the Transactions, a corrected version of the account which was printed year before last.

The specimen had been sawed out from the skull in such a manner as to show four plane and two uneven surfaces. The plane surfaces are: a vertical one, which is situated just in front of the external auditory canal and middle ear, leaving both of them intact, but traversing many

[1] See the following article.

of the large air cells which surround these parts; an inferior transverse section, which bisects the lower end of the middle ear a short distance below the point where it merges into the Eustachian tube; a superior horizontal section which passes through an intercommunicating system of air cells; and, finally, a median vertical section which leaves one condyle of the occipital part of the occipito-vertebral articulation attached to the specimen. The outer and posterior face of the specimen represents the natural surface of the skull as it appears after the soft parts have been to a great extent removed. The second specimen contains the entire Eustachian tube of the right side, from its pharyngeal orifice to its termination in the narrowed lower end of the middle ear. The third specimen consists of the membranous portion of the left Eustachian tube, divided transversely at a point about five inches from its pharyngeal orifice, and slit up longitudinally throughout a large part of its length. All the specimens are preserved in alcohol.

The external auditory canal.—The auricle had been cut away as close to the skull as possible, and all that remains of the cartilaginous portion of the canal is represented by two overlapping, funnel-shaped gutters of cartilage, which together form a complete conical framework around the skin-lined orifice of the external auditory canal. This orifice, which is nearly circular in shape, measures 9 millimeters in diameter. It enters the skull in a direction nearly parallel with the plane of the transverse vertical section. At a distance of about 2 centimeters from the orifice, the canal begins to bend backward in its course, and at the same time its calibre becomes considerably larger. At a distance of 7 centimeters from the external orifice it measures 15 millimeters in diameter. In the vicinity of the membrana tympani the calibre of the canal again diminishes in size,—to 9 or 10 millimeters, as nearly as I could ascertain. The ring of cartilage, representing, so to speak, the

insertion of the auricle, loses itself in the cutaneous lining of the canal at a distance of about $5\frac{1}{2}$ centimeters from the outer orifice.[1] The entire length of the canal from the external orifice to the membrana tympani, measures $16\frac{1}{2}$ centimeters, or about $6\frac{1}{2}$ inches. The skin lining the canal,

Fig. 1. Vertical transverse section of the skull, a little in front of the external auditory canal. To expose the latter throughout the greater part of its course, the anterior wall of the bony cylinder has been chiseled away. (Reduced to one third of the natural size of the parts.)

[1] In this particular specimen the canal was found to be filled throughout its entire length with a semi-solid material which looked like an admixture of cerumen and cast-off epidermis scales. The natural inference was, that the sedentary life and the unwholesome diet (candies, peanuts, etc.) to which show elephants are almost necessarily subjected, had produced this condition of what, in a human being, would be termed eczema.

for a distance of about 2 centimeters ($\frac{3}{4}$ inch) from the orifice, presents a finely corrugated appearance, the folds running in a direction parallel with the long axis of the canal. From this point inward, as far as to the drum-membrane, it presents a smooth, almost polished appearance.

As may be seen in the figure, which represents the parts reduced to one-third of their natural size, the cylinder of bone constituting the external auditory canal lies in the midst of a labyrinth of intercommunicating cells or chambers of varying size and shape. About midway between the drum-membrane and the outer orifice this bony cylinder lies below a cavity of unusual size. How far this cavity extends upward I am unable to determine, as the upper part of the skull is not before me: but that part of the cavity which is visible in the specimen measures a little over 11 centimeters ($4\frac{1}{2}$ inches) in its transverse, and at least 15 centimeters (6 inches) in its vertical diameter: this latter measurement extending from the surface of the section (superior transverse horizontal section) to the lower limits of that portion of the cavity which lies below and in front of the bony cylinder. All these (presumably) air chambers communicate freely with each other, sometimes by very broad openings. So far as I am able to find out by careful exploration with a probe and by forcing smoke through different channels, these cavities do not communicate with the tympanum proper, but do apparently communicate directly with the nasal system of cavities. In the human being the pneumatic cells do not communicate with the cavities belonging to the nasal system except through the Eustachian tube. In this respect, therefore, the mastoid cells[1] of the elephant differ materially from those of man.

[1] In the human being pneumatic cells are found not only in the mastoid process, but also above the dense cylinder of bone which immediately surrounds the calibre of the external auditory canal,—that is, in the very same locality as that occupied by the cells here under consideration. Hyrtl, in

The *Eustachian tube*, from its pharyngeal[1] or nasal orifice to the point where it emerges into the tympanic system of cavities, measures 11 centimeters (4⅜ inches). Its nasal orifice, in the present specimen, is more or less mutilated; but it is evident that in its general features and size it resembles very closely the pharyngeal end of the human Eustachian tube. The latter is perhaps a trifle larger, and it stands out more prominently from the surrounding surface of the mucous membrane. Toward the tympanum the tube ends in a nicely rounded orifice, one side of which apparently corresponds with the termination of the long and thick cartilaginous cylinder, around which the tube is curved, gutter-like. As the specimen had been preserved in alcohol for two or three months I was not able to make out satisfactorily, by simple naked-eye inspection, the exact relations of the different tissues of the tube to each other. At the two orifices the calibre appeared to be small, *i. e.*, simply large enough to admit easily a large-sized probe. A section near the middle portion of the tube revealed at first no calibre whatever, the opposite walls being apparently in perfect contact at all points. By manipulating the specimen, however, these closely applied walls could be made to separate, thus revealing to view a calibre large enough to admit the little and perhaps even the third finger. The top part of a question mark represents fairly well the cross section of the calibre of the tube, when in a state of rest, at a point about half-way between the two orifices. Toward the tympanum the tube does not open directly into

his "Anatomische Untersuchungen über das Gehörorgan des Menschen und der Säugethiere" (Prag, 1845), says that "the pars mastoidea of the temporal bone is, according to Köstlin, wanting in the hippopotamus, the elephant, and the rhinoceros."

[1] The specimen is too fragmentary in character to warrant me in drawing any conclusion whatever in regard to the relations of the peripheral end of the Eustachian tube to the nasal and pharyngeal cavities. It is for this reason that I employ the terms pharyngeal and nasal indifferently.

the tympanic cavity proper, but into an elongated air chamber, which lies anteriorly to this cavity, and opens into it through an elongated slit-shaped opening. This chamber commences as a *cul-de-sac* at the orifice of the tube, and gradually increases in size, throughout a length of between 4 and 5 centimeters (about 2 inches). Like all the air chambers thus far mentioned, its walls consist of thin bone lined with a smooth mucous membrane. The antero-posterior diameter of the cavity, at a distance of 3½ centimeters from the orifice of the tube, measures nearly three centimeters (1⅛ inches); the breadth varies but does not exceed 1½ centimeters (⅝ inch) at any part. The opening from this chamber into the tympanum proper is an elongated slit and presents one or two peculiarities. The edge of the opening, on the side toward the median line, is provided with two odd-looking osteophytes, one resembling a cock's comb, the other a padded drum-stick, such as is used in beating a big bass drum. The slender handle of this miniature drum-stick is perhaps 4 millimeters long and scarcely half a millimeter thick, and at the end of it is a well rounded knob, fully two millimeters in length and about a millimeter and a half in thickness.[1]

[1] Hyrtl says nothing about the occurrence of these osteophytes in the elephant in particular, but he refers to their existence in some animals in the following words: "In certain animals possessing a roomy tympanic cavity there are found, either in the middle ear proper or in some of the cavities which communicate with it, bony outgrowths of characteristic shape. As these objects are found, with rare exceptions, to be always of about the same size and to occupy relatively the same positions, the inference is permissible that they are not mere accidental formations, but probably possess some functional importance. * * * * * * * In the posterior segment of the bulla [tympanica] of the lion these curious structures attain their highest degree of development, and may be seen here in the form of pear and other shaped bodies springing by a slender (sometimes hairlike) stem from the floor of this cavity." From this description, and also from the pictorial representations which he gives of these bodies, it is clear that they are identical with those which I have described above.

Still another peculiarity is observable at the opening which leads from the Eustachian vestibule, if I may so call it, into the tympanum proper. A little behind the opening the back wall of the vestibule becomes sharply grooved — very much like the groove of bone which, in the human being, holds the belly of the tensor tympani muscle — and runs upward, and finally a little forward to the anterior and middle portion of what may properly be termed the annulus

Fig. 2. View of the membrana tympani and grooved antero-external wall of the passage leading from the tympanum proper to the Eustachian tube. The sharp-edged ridge running along the middle of the grooved antero-external wall and dividing it into two subordinate shallow grooves, may be seen in the picture. (About one-third natural size.)

tympanicus. This groove extends so far outward that its outer wall is well outside of the plane of the drum-membrane. The anterior wall of the vestibule constituting one of the two grooves already mentioned displays three openings — two oval in shape and one nearly circular — which lead into adjacent air chambers; the other groove is smooth and free from openings throughout its entire length. The chambers just mentioned have no communication one with another, nor with any of the neighboring cavities. The antero-posterior diameter of the vestibule is 21 millimeters (nearly $\frac{7}{8}$ inch). The breadth of the posterior wall, opposite the osteophytes, is 1 centimeter ($\frac{3}{8}$ inch).

The tympanic cavity. — Looked at from below, this cavity seems to be separated into two parts by a projecting mass of bone, the sides of which form, roughly, an angle of 45°. That part of the cavity which lies nearer the median line is considerably larger than that which is in the immediate neighborhood of the drum-membrane. The roof of this outer cavity (or tympanum proper) pos-

sesses certain peculiarities which will be described more fully by Dr. Richards.

The antero-posterior diameter of the tympanic cavity, directly abreast of the membrana tympani, is 27 millimeters ($1\frac{1}{16}$ inches) and its average breadth 25 millimeters (about 1 inch). Its height could not be accurately ascertained, but it must have been at least 50 millimeters (2 inches).

The outer wall is made up of the grooved structures which I have described above, and of the *membrana tympani*. This latter membrane, which is shown fairly well in Figs. 2 and 4, is decidedly conical in shape, as seen from

Fig. 3. View of the tympanic cavity from within, showing (distinctly in the photograph but very faintly in the engraving) the stall-like openings behind and below the floor of the tympanum, a part of the jagged wall surrounding the mouth of the well-like excavation, the two osteophytes and the grooved outer wall of the passageway leading from the tympanum to the Eustachian tube. (Slightly reduced in size.)[1]

the side of the tympanum, while the surface of the membrane on the side toward the external auditory canal presents scarcely any hollowing-out at all,—barely enough to

[1] The difficulties encountered in photographing the middle ear from different points of view were found to be very great, and as a consequence the half-tone pictures which accompany this article leave very much to be desired in the way of clear definition.

justify the use of the expression, a shallow cone. This lack of agreement between the two surfaces is due apparently to two facts: the marked curving inward of the tip end of the manubrium mallei, and the great thickness of the soft parts in the vicinity of the umbo of the membrane. From the great resistance which the latter offers to pressure made at any point of its surface I should infer that its thickness is at no point less than one millimeter. As a whole the membrane is nearly circular in shape and measures fully two centimeters ($\frac{3}{4}$ inch) in diameter.

Superiorly the tympanic cavity terminates in a *cul-de-sac* composed of soft tissues, which form a thick diaphragm separating the tympanum proper from a second, much smaller cavity containing the head of the hammer, all of the anvil, and presumably the stirrup. From the posterior part of this *cul-de-sac* the chorda tympani nerve passes forward, and then outward, in the form of a strong rounded cord, across the inner aspect of the neck of the hammer, at right angles to the manubrium. There is apparently no trace whatever of a tensor tympani muscle.

The comparatively small area of bone surface constituting the inner wall of the tympanic cavity proper presents, directly opposite the umbo of the drum-membrane, a rounded eminence in which no openings are visible. This is probably the analogue of the promontory in the human being. Behind it, and situated at a higher level, is a rounded ridge of bone which terminates in a hooded opening or niche, suggesting the niche for the fenestra rotunda; but a careful exploration with the probe fails to detect any break in the hard, bony surface at the bottom of the niche.[1] Further-

[1] Hyrtl (op. cit.) says that the fenestra rotunda, in the elephant, is to be found behind an angular overhanging projection of the promontory, and that the actual opening of communication between the tympanum and the scala tympani is a mere narrow slit. He quotes Cuvier as saying that the fenestra rotunda of the elephant is very small, irregular in shape, and concealed behind a projecting part of the promontory. At the same time

more, this niche faces forward and inward, whereas that of the fenestra rotunda in the human being faces backward and outward, and its position is altogether too far removed from the stirrup. The mere use of a probe is not sufficient to determine this question satisfactorily and I must, therefore, leave it unsettled. The rest of the inner wall of the tympanum, down to the point where it bends abruptly around the blunt anterior edge of the promontory described above, presents no features of special interest.

The posterior wall of the tympanum, in the vicinity of the promontory, is smooth, but on a line with the posterior margin of the annulus tympanicus it terminates abruptly in a thick, rounded edge which projects free into the air space. This edge represents the inner and lower termination of the bony cylinder constituting the external auditory canal. In the excavation behind and beneath the edge of bone just mentioned may be seen three sharp-edged membranous septa, dividing the space into three deeply-shaded recesses and one shallow *cul-de-sac*, all facing obliquely inward. Taking them in regular order from above downward I explored each stall with the probe, and found that the first one is a mere *cul-de-sac*, extending to only a slight depth. The second one, which presents the largest opening, measures 33 millimeters ($1\frac{1}{4}$ inches) in length and runs apparently directly behind, and nearly in the same direction with, the external auditory canal. By withdrawing the probe a short distance and at the same time causing it to press against the antero-inferior wall of the channel, one becomes conscious that the end of the instrument reaches the free edge of an elastic septum that divides this second stall into two subordinate channels. The long axis of this second subordinate channel measures 30 millimeters ($1\frac{1}{8}$ inches). The third stall is somewhat nar-

he states that Fick (*Ueber das Labyrinth des Elephanten*, in Mueller's Archiv, 1844, p. 431) believes that this opening is the outlet of the aquæductus cochleæ, and that the elephant has no true fenestra rotunda.

rower at the entrance than the one just described. It consists apparently of a single passage without any bifurcations, and measures, from the entrance to its farther end, nearly 70 millimeters ($2\frac{3}{4}$ inches). Its general direction corresponds quite accurately with that of the external auditory canal. The fourth stall has a length of 52 millimeters (2 inches), and its long axis, whose general direction is outward, forms an angle of about 40° with the axis of the external auditory canal. The floor is lacking close to the entrance, and the space is occupied by a deep excavation from which the probe passes downward into a large chamber.

The pit into which the stalls open is characterized by the presence, on its inner side, of a honey-comb structure which projects to such a degree as to partially conceal the entrances to the stalls. One of them is particularly conspicuous by reason of its perfectly cylindrical shape, by the jagged character of its free edge, and by the depth (20 millimeters—$\frac{3}{4}$ inch) of the enclosed well, which seems to have no communication with any of the adjacent cavities.

The large cavity which I mentioned in the earlier part of this description as forming an acute angle with the tympanum proper, presents few features of special interest. Its total length, or rather height, is approximately 50 millimeters (2 inches); its maximum transverse diameter is 30 millimeters ($1\frac{1}{8}$ inches) and the minimum 20 millimeters ($\frac{3}{4}$ inch). At the upper and back part of this subsidiary tympanic cavity are two triangular openings with smoothly rounded edges. The inferior opening seems to lead into the general system of air cells which surround the external auditory canal; the superior opening leads into a long cavity, or system of cavities, which certainly do not communicate with these cells. A probe introduced into this superior opening can be passed, in an outward and somewhat upward direction, to a distance of 85 millimeters

($3\frac{3}{8}$ inches) without encountering any resistance. Several other openings are visible along the outer wall of the subsidiary tympanic cavity, but with one exception they all lead into shallow pockets or diverticula. In this single exceptional instance a slightly curved probe can be passed in to a depth of 25 millimeters (1 inch). This small curving cavity is situated in the mass of bone which forms the

Fig. 4. View of the subsidiary tympanic cavity as seen from within and behind, after the removal of the greater part of the anterior and upper boundaries. (Natural size.)

angle between the tympanum proper and the larger subsidiary cavity.

We come, finally, to the consideration of the small cavity lying above and behind the tympanum proper, the cavity containing the anvil, the body or head of the hammer, and presumably the stirrup. The plate of bone covering both this cavity and that of the tympanum proper was found to

be of considerable thickness, probably at least 5 millimeters ($\frac{3}{16}$ inch) thick. This smaller cavity, as we have mentioned before, is entirely shut off from the tympanum proper. It is, roughly measured, about ten millimeters ($\frac{1}{2}$ inch) square. From the forward and outer corner of this cavity a probe can be passed, in a direction parallel with the long axis of the external auditory canal, a distance of 55 millimeters ($2\frac{1}{4}$ inches) before it encounters any obstacle. By the smoke test it appears that this cavity or channel is a closed sac, having no communication with the adjacent system of pneumatic cells, and therefore not representing, in a physiological sense, the analogue of the mastoid antrum in the human being.

The space between the tegmen tympani and the head of the hammer and body of the anvil, was found to be filled with a mass of soft connective tissue (almost like adipose tissue). Its removal disclosed to view the interlocking malleo-incudal joint. The body of the anvil overtowers the head of the hammer; that is, it is decidedly nearer the tegmen tympani. There is quite free play between the two ossicles, both of which, however, may be described as being very solidly anchored in their respective positions. Considerable force may be applied to the handle of the hammer near the umbo of the membrana tympani before any visible excursion of the head of this ossicle can be distinguished. The same degree of force applied to the handle of the hammer apparently fails to produce any motion whatever in the anvil. Direct pressure upon the latter must be of a very decided character before visible motion can be excited in it. A strong membranous capsule spans the space between the opposite edges of the malleo-incudal joint.

A FURTHER REPORT ON THE ANATOMY OF THE ELEPHANT'S EAR.

By Huntington Richards, M. D., *New York, N. Y.*

When Doctor Buck committed to me a continuance of the dissection and description of the larger one of the two anatomical specimens discussed in his papers entitled "A Contribution to the Anatomy of the Elephant's Ear" and "A Revised Description of the Anatomy of the Elephant's Ear," he had obtained from Prof. Wilder his consent to the removal of certain restrictions in regard to destruction of the specimen as a museum preparation, which had greatly hampered him in his work. These restrictions had handicapped him. Through his kind stipulation I was freed from this handicap at the very beginning of my further investigations, and, in consequence, very soon made a discovery leading to the necessary revision of the doctor's first paper in the second just presented to the Society for publication in this year's annual Report. The outer surface of the specimen up to the moment of this discovery had been believed by Dr. Buck and myself to be also its lower surface and a part of the lateral aspect of the elephant's head, — a belief confirmed by the assumed direction of the Eustachian tube, and unshaken by any information provided (for none was given) regarding the direction of the planes of section made at Cornell University. This surface was covered by a layer of very dense, tough, leather-like tissue (muscle-stumps, fibrous tissue, fat, etc.), hardened by prolonged immersion in alcohol, which layer effectually masked all inequalities of surface existing in the underlying bone. Its

removal from the bone was the work of no inconsiderable difficulty. When effected the very marked inequalities of bone surface shown in my first illustration were revealed. The relation borne by these inequalities to the meatus of the auditory canal, and a comparison of the specimen, thus fully stripped of all so-called soft parts, with the elephant skulls at the Central Park Museum, proved clearly that this surface was a part of the posterior aspect of the skull, that the direction of its plane was nearly vertical, and that consequently the directions and relations described in Dr. Buck's first paper required the revision he has given them in his second paper now issued to supersede the former.

This illustration (Fig. 1) shows the back of the specimen, a part of the front section of which is shown in Fig. 1

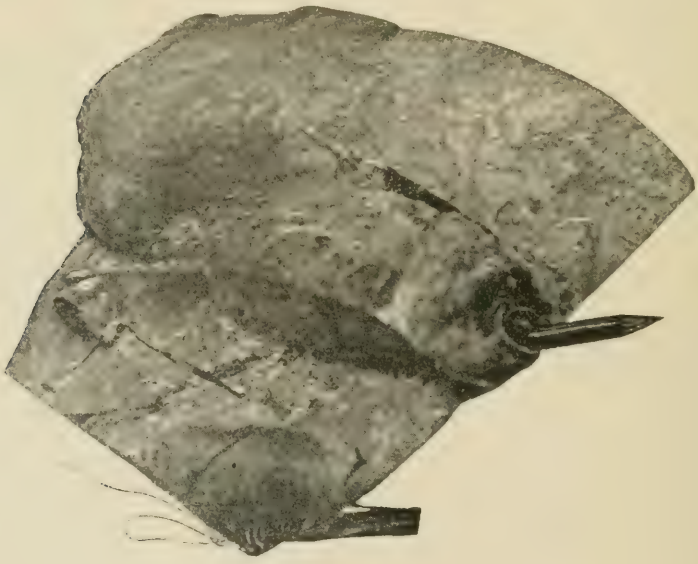

Fig. 1.

of Dr. Buck's paper, and the left hand border of the latter corresponds to the upper border of my picture. In this picture a lead pencil is seen protruding from the meatus of

the auditory canal, into which it had been inserted in order to show the direction pursued by that canal. The points shown by Dr. Buck's illustration are described in his paper. In my own illustration the following points call for especial attention. At the right hand lower corner is seen a part of the articular surface for the condyle of the lower jaw. The left hand portion of the illustration shows an unmistakable mastoid prominence; immediately below this the stump of a cartilaginous process, clearly the analogue of the styloid process in man; and, to the right of, *i. e.*, external to, this process, the entrance of a canal into which and through which a probe has been passed. The opposite extremity of this probe (which was, by the way, a stout kitchen skewer 2½ millimeters in diameter) can not of course be seen in the illustration. It emerged from an opening on the anterior aspect of the specimen lying immediately above that part of the tympanum containing the ossicles and immediately external to the cavity of the vestibule (which had been opened by Dr. Buck). Into this anterior opening passed a thick bundle of nerve fibres which traversed the canal and had to be forcibly crowded aside to admit the passage of the probe. This bundle of fibres was, at a deeper part of its course, in close relation to the auditory nerve; it was manifestly the facial nerve, and the canal traversed by it and by the probe (or skewer) was clearly the Fallopian canal. The illustration (in which the specimen is seen tipped considerably to the right and also somewhat away from the spectator) shows the parts as about one-third of their natural size. The mastoid process or protuberance, measured from the top of the specimen to its tip, is 10½ centimeters long; but it is probably only throughout the lower half of this distance, viz., for about 5 centimeters upwards from its tip, that this protuberance on the back of the skull can be rightly regarded as a mastoid or teat-like projection. The cartilaginous stump

already spoken of as the analogue of the styloid process in man (an ankylosed union of the tympanohyal with two others — the periotic and stylohyal) measures 3 centimeters in length, not quite 2 centimeters (19 millimeters) in width, and 9 millimeters in thickness. As shown in the picture, its cross section is elliptical in outline. Flower, in his "Introduction to the Osteology of the Mammalia" (p. 181), says of the tympanohyal bone of the elephant, that it is "distinctly seen at the bottom of a deep fossa between the squamosal exoccipital and tympanic with the stylo-mastoid foramen to its outer side." Such is the situation of the cartilage stump now under discussion, which must therefore be either the unossified tympanohyal, or else a cartilaginous bunch uniting the lower end of this bone with the upper end of the stylohyal, the next lower bone of the anterior hyoidean arch (see under description of the dog's skull, op. cit., p. 123). To one who has superficially examined the specimen, or who has merely looked at the illustration I am now describing, the statement of Flower that the mastoid portion of the periotic bone in the elephant "is very small and does not appear on the surface of the cranium" will seem very singular. A careful examination of the specimen, and especially of such a cross section of it as is partly shown in Fig. 2, demonstrates, however, the correctness of this statement. A line of suture separates the periotic bone from the exoccipital and it is to the latter bone that properly belongs the great mastoid process seen in Fig. 1. The very large pneumatic cells of this mastoid process appear to have no communication across this suture with the smaller pneumatic cells found in the posterior and lower part of the generally very dense periotic, and it is this posterior part which probably is, strictly speaking, the mastoid portion of that bone. Hence I have been careful to call the marked and distinctly teat-like prominence upon the skull

surface the mastoid *process* rather than the mastoid *portion*. It appears to be a sort of false mastoid portion as compared with that of man. In man the mastoid process is identical with the mastoid portion of the periotic bone, the periotic by this mastoid portion taking a part in forming the outer surface of the skull. In the elephant the periotic does not come to the surface as a mastoid process, and the mastoid process is an integral part of the exoccipital bone. From its position in relation to neighboring structures as well as from its shape I cannot but believe this mastoid process to be identical with the "paroccipital (or paramastoid) process" of the exoccipital described by Flower and by him said to be the analogue of the jugular eminence in man (op. cit., pp. 98, 112, and 132); and yet this author states distinctly that in the elephant there are no paroccipital processes (p. 181). In describing the skull of the dog, which he takes as a type for that of all mammalia, he speaks of the "paroccipital (or paramastoid) process" as a prominent process of the exoccipital serving for muscular attachment lying external to the occipital condyle and separated from it "by a deep depression," and also as "projecting backwards and downwards." The stylo-mastoid foramen he also locates as external to this process (p. 119). Not only do the large pneumatic cells of the mastoid prominence fail to communicate across the suture with the far smaller cells of the deep-lying mastoid portion of the periotic, but they are also by the bony walls lying upon both sides of this same suture shut off from communication with the exceedingly large pneumatic cells surrounding the tubular auditory canal. These latter cells belong to the squamosal bone. The external auditory canal of the elephant is formed according to Hyrtl only by the squamous portion of the temporal bone. Flower describes it as formed almost exclusively by this bone (the squamosal) and says that the tympanic contributes very

little to its formation. As regards the periotic bone, I have spoken above of the relatively small pneumatic cells found in its posterior portion and have said that this was probably the true mastoid portion mentioned by Flower. Köstlin however denies the existence of any mastoid portion (pars mastoidea) in the elephant; and without a violent disruption of the specimen now under discussion I can not determine whether these pneumatic cells belong strictly speaking to the periotic bone or to the tympanic, with which latter the periotic is even in the young elephant completely united (see Flower, op. cit., p. 181). I can detect no line of separating suture between the cell-containing lower posterior part of what certainly seems an integral portion of the dense periotic and the higher-lying and more forward-lying part of the periotic, containing the vestibule, cochlea, and semi-circular canals but otherwise quite lacking in cellular structure.[1] As to these pneumatic cells which we may pretty safely assume to be within the periotic bone, it would perhaps be more correct to speak of them as a single cell with freely communicating and wide-mouthed side crypts than to regard each of these crypts as a separate cell; this single cell with irregular side crypts or alcoves is as yet the only pneumatic space I have been able to detect within the per-

[1] I have said that the cells within the mastoid process of the exoccipital bone do not communicate with any cells within the periotic. I may add that in the line of this suture and between these two bones is found a small portion of a third bone independent of both the others and having within it small cellular spaces communicating with neither of these two. To what bone this portion belongs I do not know; clearly not to the exoccipital; seemingly also not to the periotic; for the upper part of the periotic is separated from it by a line of suture. It may be a portion of the tympanic (although the latter bone is firmly joined to the periotic below); or it may belong to the squamosal. I am disposed to regard it as a portion of or process from the latter. This process, to whichever of these two bones it may belong, takes part in the formation of the outer wall of the upper part of the secondary tympanic cavity described by Dr. Buck.

iotic bone. This very irregularly shaped cavity measures 2 centimeters wide in its greatest diameter and 1½ centimeters long in its least diameter (the antero-posterior). The section of the bone shown in Fig. 2 bisected it in the plane of the latter. It communicates by an irregularly heart-shaped opening 8 millimeters wide with the secondary tympanic cavity described by Dr. Buck. This opening is very distinctly shown in Fig. 2, and through it the observer looks directly inwards into the secondary tympanic cavity.

There is no communication whatever between this cell and any of those comprised in the pneumatic system of the squamosal bone. Its larger part is not shown in Fig. 2, being continued within the outer portion of the specimen that was removed in making the section. A branch from this outer and larger part sweeps half way round the Fallopian canal, and the blind extremity of this branch, 6 millimeters in height and 3 millimeters in width, closely approaches the upper wall of the auditory canal at a point but a few millimeters external to the margin of the drum-membrane; from the auditory canal at this point it is separated by a bony septum only 2 millimeters in thickness; from the Fallopian canal on the upper and outer aspects of the latter it is separated by a mere shell of bone not more than ½ millimeter thick. The section of the bony septum between the auditory canal and Fallopian canal, as seen in Fig. 2, passes across this septum almost precisely on a level with the blind end of the branch just spoken of as sweeping half way round the latter canal, so that the very shallow cup-shaped depression formed by the end of this branch upon the cut surface of the septum between the two canals, while plainly distinguishable in the specimen and indistinctly so in the photograph, is not, by reason of the imperfections of the art of engraving, to be made out in the illustration. Its position on the cut surface of the septum is directly below the lower corner of the irregularly

heart-shaped opening into the secondary tympanic cavity, which opening is seen as a black hole somewhat above and to the left of the central point of the picture. The large intra-petrous cell I am now describing does communicate therefore with the lower part of the tympanum *through the medium of the secondary tympanic cavity*, but it does not communicate with the chamber containing the ossicles; yet it is probably the analogue of the mastoid antrum in man.

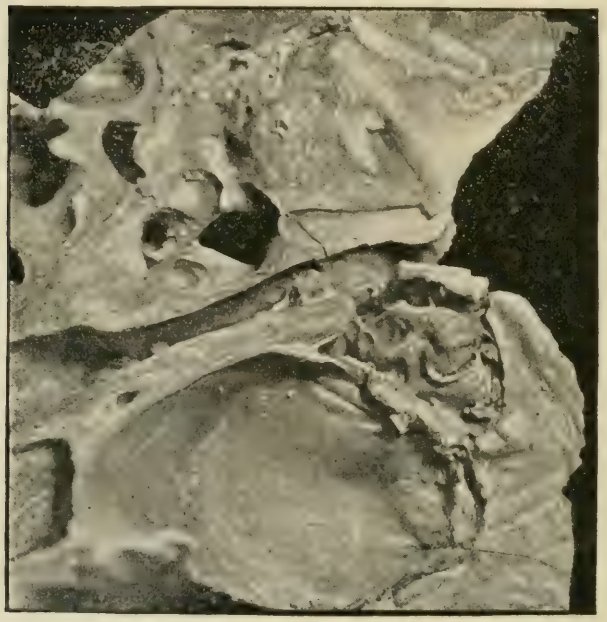

FIG. 2.

The three cells whose anterior extremities are seen in the upper left hand corner of Fig. 2 belong to the system comprised within the mastoid prominence of the exoccipital bone. The curved line of suture separating this bone from the squamosal (or it may be the tympanic at this pre-

cise point) has its extremities, so far as shown in the illustration, at the points marked *a* and *b* on the margins. From *c* on the upper margin the suture separating the squamosal (or the tympanic?) from the periotic runs diagonally downwards and to the left until it meets the former.

The chief object that I desired to attain by the presentation of Fig. 2 was a demonstration of the course, calibre, and direction of the Fallopian canal. This demonstration the picture gives fairly well. All the structures represented are shown somewhat larger than their natural size, being magnified about 20 per cent.; the view is taken looking directly toward the median line, *i. e.*, from without inwards: the top and bottom of the picture show respectively the top and bottom of the specimen; and the frontal aspect of the specimen is that seen toward the right of the observer. In preparing the specimen for this demonstration of the Fallopian canal two planes of section were followed, the upper one vertical and antero-posterior, the lower one also antero-posterior but meeting the upper plane at an angle of about 150 degrees, and passing obliquely downwards and somewhat outwards, *i. e.*, towards the spectator, in the illustration; the upper section was begun from the canal and was made by inserting the fine saw blade through the canal and cutting thence toward the surface of the bone. The lower section, if I recollect aright, was made from the surface towards the canal.[1] It was this lower section which obliquely cut

[1] If any reader of this article desires to know the direction pursued by these two planes of section with relation to the outer surface of the skull let him again refer to Fig. 1, representing this surface. When these sections were made there had already been removed from the specimen one large upper fragment and three smaller lower fragments, all four of which are shown, held in their original positions by wires, in this figure. The central portion alone of the specimen, the one containing the auditory canal, the tympanohyal, the Fallopian canal, and most of the mastoid prominence, together with the important structures of the middle and internal ear not shown in this view, was the portion operated

across the auditory canal so as fully to expose to view (and to the photographer's camera) the outer surface of membrana tympani shown in the illustration and to divide the bony septum between the Fallopian and auditory canals. In making the section the extreme tip end of the short process of the anvil was cut across close to its point of articular insertion, and in this and other manipulations of the bone a fragment of this septum, about 1 centimeter long, 4 or 5 millimeters broad, and 1½ millimeters thick, and constituting a portion of the party wall between the Fallopian canal above and the chamber containing the ossicles below, became separated and rode upwards and forwards from its normal position. This fragment is seen in the picture lying directly above the body of the incus. Of an accident which was the chief cause for the breaking away of this fragment I shall have occasion to speak when I come to the description of Fig. 3 and Fig. 4.

Returning now to the description of Fig. 2.—The direction pursued by that portion of the Fallopian canal which is shown in this picture was found to be nearly horizontal, declining but little in a downward direction as it proceeded backwards to its termination at the stylo-mastoid foramen. Its average diameter throughout this part of its course is about 5 millimeters: its length is 55 millimeters. The total length of the canal I am unable to state, for in the dissection that exposed the cavity of the vestibule the anterior and upper wall of that part of the nerve channel (not shown in the illustration) which curves downwards and towards the median line in front of and above the tegmen tympani had been removed. This direction of downward and forward curvature in the canal begins at a

upon. The upper section ran along a line parallel with the left (mesial) border of the specimen and leading directly upwards from the stylo-mastoid foramen; the lower section ran along a line extending upon the surface obliquely downwards and outwards from this foramen to the lower border of the bone.

point about corresponding to that extremity of its lower bony wall from which the left hand or posterior extremity of the semi-detached fragment seen in the illustration has broken away. An elongated hiatus in the inner and lower wall of the canal (nearly 15 millimeters long and from 2 to 4 millimeters wide) shows that the facial nerve in its passage above the roof of the upper tympanum is not entirely separated from the latter cavity by a bony partition. The elongated hiatus seems to be at its posterior extremity continued into a line of suture, which exists on the inner or mesial aspect of the canal, runs throughout the entire length of the canal, and appears to be a line of apposition or suture between the periotic and tympanic bones. Whether, however, this may not be a suture line between these two bones united together on the one hand and the squamosal on the other, I can not determine from the specimen before me, at least in its present condition and without further and very destructive, not to say violently disruptive, dissection, the lines of suture in the deeper parts of the specimen being very narrow, their course very tortuous and complicated, and the union between the component bones of the specimen being one of veritably rocky firmness. Neither can I discover an elucidation of this point in the few books on anatomy readily at my command.

As shown in the illustration, the Fallopian canal near its external mouth at the stylo-mastoid foramen becomes greatly dilated. The diameter of this outer dilated portion —and consequently that of the aforesaid foramen —is 14 millimeters; its length, or depth, from the posterior surface of the skull is about two centimeters. At the inner (and forward) extremity of this dilated portion the facial canal is joined by another canal having a diameter of 3 or 4 millimeters, which, running upwards, forwards, and inwards from this point of junction with the facial,

opens on the inner surface of the specimen (seen in Fig. 3) at a point directly behind the back wall of the secondary tympanic cavity and opposite the junction between the narrower and wider portions of the latter. Embedded in the tough mass or chord of tissue which was extracted from this channel was an artery of considerable size,—a branch, no doubt, of the stylo-mastoid artery. At a point on the lower and anterior wall of the facial canal, on a line with the opening of this large arterial channel, a small branch of the facial nerve enters the bone in a direction leading toward the upper tympanum. This I take to be the chorda tympani nerve. Its ragged end is indistinctly seen in the illustration projecting into the facial canal just at the beginning of its narrower portion. Immediately below this nerve tag on the cut surface of the septum between Fallopian and auditory canals is seen an opening some three or four millimeters wide. This is a cross section, close to its outer extremity, of the first of the two channels leading from the second "stall" described by Dr. Buck,—a channel by him ascertained to have a length of 33 millimeters. What looks like a large cell near the lower left hand corner of the illustration is a cross section of the "single passage without any bifurcations" and measuring nearly 70 millimeters in length, which Dr. Buck found leading outwards from the third of the four "stalls." The tympanic mouths of these stalls are shown indistinctly in Fig. 3 of Dr. Buck's paper and somewhat more distinctly in Fig. 3 of this paper. In my illustration the septa dividing them are on careful inspection to be made out at the bottom of a dark elongated vertical hole lying immediately to the right of, *i. e.*, behind, the border of the membrana tympani.

Again returning to Fig. 2.—I beg to call the reader's attention to the tolerably clear view given of the cavity of the upper tympanum containing the ossicles. The heads of the hammer and anvil and their now partly

separated articulation show quite well, as do also the short and long processes of the anvil, the cup-shaped head of the stirrup (from which the latter process has become disarticulated), and the tendon of the stapedius running from the stirrup head in a direction upwards and backwards. Part of the exposed neck of the hammer is also well shown, while the pushing outwards of the membrana tympani near its upper border by the short process of the hammer, and the shallow cup-shaped, or, rather, saucer-like, dragging inwards of the membrane by the tip of the hammer handle, can also indistinctly be made out. What in man would be the posterior crus of the stapes is in the elephant the superior crus. It can be dimly seen in the picture as it runs upwards and inwards (*i. e.*, away from the spectator) from the head of the bone, its direction, as shown in the picture, forming an angle of about thirty degrees with that followed by the stapedius tendon. Some account of the ossicles and of the closed chamber in which they lie has been given already by Dr. Buck. Except as regards the stapes and the stapedius tendon, I have been able to add but little to this account besides the presentation of this illustration in the present paper. A separation of the outer wall and of the hammer and anvil from the inner wall of the tympanum and from the now detached head of the stirrup will doubtless give a clearer view of the form, relations, and connections of the ossicles; but the result of such an examination, and also of further investigation of the labyrinthine structures in the petrous part of the periotic, must be deferred until the issue of still another paper.

Before turning to a consideration of the next illustration, Fig. 3, I desire to say a word regarding the large cells existing within the mastoid prominence. Three of the largest of these cells are seen in that part of the specimen shown in this picture, but they appear only by their inner or

forward extremities in the engraving:—one of them, the middle one of the three, about an inch below its upper left hand corner; another, the lowest of the three, just a little above *b* on the margin. The septa dividing these cells run at right angles to the skull surface. The length of the upper and middle cells, measured in an antero-posterior direction, is 45 millimeters, that of the lower one is 30 millimeters. The vertical height of all three is about 2 centimeters; the extent of the middle one in a horizontal direction—at right angles with the mesial plane of the skull—is about the same, viz., 2 centimeters; that of lower one is fully 45 millimeters. It is with the system of cells contained within this mastoid prominence of the exoccipital bone that communication from the secondary tympanic cavity is established through the medium of the "two triangular openings with smoothly rounded edges" mentioned by Dr. Buck as existing at the inner upper and back corner of this cavity; and my further dissection has therefore shown that neither of these openings leads into the system of cells (belonging to the squamosal) "which surround the external auditory canal." What appears in the illustration to be a fourth cell lying immediately to the right of, *i. e.*, anterior to, the extremity of the middle one of the three just described is in reality a corner—the upper outer and back corner—of the secondary tympanic cavity cut across and opened by the section of the bone. It is precisely at this point that the meeting takes place between the two suture lines already mentioned,—the occipito-squamoso-periotic (or occipito-tympanic?) and the periotico-squamosal (or periotico-tympanic?).

I turn now to a brief discussion of my third illustration (Fig. 3). The point of view in this picture is diametrically opposite to that of Fig. 2; the observer has before him the inner and vertically cut surface of the entire specimen and is looking directly outwards, in a direction parallel with the

auditory canal, towards the lateral aspect of the skull; in other words, the surface here shown is that of the plane of antero-posterior vertical section, the posterior border of which is the left hand border of the bone, as looked at from behind, in Fig. 1. The principal things shown by

Fig. 3.

this picture are such as have been already described by Dr. Buck, and some of which, seen from a slightly different point of view, are shown also in his illustrations numbered 2, 3, and 4. The reduction in this illustration of mine is one-half. I print it for several reasons, viz., as

supplementary to those of Dr. Buck, as being — thanks to the photographer—a clearer view, and, finally, as especially illustrative of points particularly touched upon in this paper. Among the latter I wish to call especial attention to the great mass of leathery "soft parts" here seen on section as detached from the upper, and still closely and intimately adherent to the lower half of the posterior external aspect of the skull. The reader will please observe how this tissue dips into the deep fossa below the mastoid tip and how far (even as thus seen only along the line of section) it serves to mask the existence of the mastoid eminence. I can again assure him that the removal of this tissue, comprising the periosteum, from the fossa in question, from around the cartilaginous stump corresponding to the human styloid process, and from the mouth of the stylo-mastoid foramen, was a work calling for the expenditure of much time and occasionally of considerable physical force. Cross sections of four (and at the top of the specimen of part of a fifth) mastoid cells are seen in the picture close to the posterior surface of the skull. The fibrous mass of tissue seen running almost vertically upwards from the upper part of the secondary tympanic cavity occupies a groove which marks the position and course at this point of the suture intervening between the mastoid prominence of the ex-occipital and the bony process interposed between this prominence and the pars petrosa of the periotic, viz., the occipito-squamosal part of the occipito-squamoso-periotic suture. On the anterior surface of the pars petrosa at a point about half-way down the front (left hand) border of the specimen is seen the bundle of fibres comprising the facial and auditory nerves. On a horizontal line drawn backwards between this bundle of fibres and the lowest of the five visible mastoid cells we see the narrowest portion, or isthmus, of the secondary tympanic cavity,

and, as already stated, it is close to the back border of this isthmus that the canal containing what I have assumed to be a branch of the stylo-mastoid artery emerges. As shown in Fig. 3, the mouth of this canal looks very small. This was because it still contained the artery and other traversing tissues. On their removal the diameter of this inner opening of the canal was found to be about 4 millimeters. The accident alluded to under the discussion of Fig. 2 can better be described in connection with this Fig. 3, as this illustration shows the specimen in its entirety. While making the second of the two sections intended to expose the Fallopian canal the bone was held firmly braced by pressure against its upper border and lower anterior corner. An increase of this pressure suddenly produced a crack which traversed the back part of the periotic and the tegmen tympani in a vertical direction, partly dislocating the ossicles and anteriorly tearing the membrana tympani loose from its attachment to the annulus. To remedy the effect of this tear I braced the membrane by the fine wire shown near the lower right hand corner of Fig. 2. This tear and the partial dislocation of the ossicles I regret, though less than I do another effect of this fracture shown but too distinctly in Fig. 4, viz., the tearing through, along the line of the promontory, of the thick membranous partition which up to that moment had quite separated the tympanum proper below from the upper chamber containing the ossicles above. In making further dissections, however, this same accidental fracture is likely to prove decidedly helpful.

Fig. 4, though on a larger scale, is in other respects nearly identical with Fig. 2 of Dr. Buck's paper. In both the observer is supposed to be looking almost directly upwards towards what I may venture to term the membranous tegmen of the lower tympanum in contra-distinction to the bony tegmen of the upper tympanum or ossicle

chamber. This view shows very clearly the course of the chorda tympani nerve forwards and outwards around the

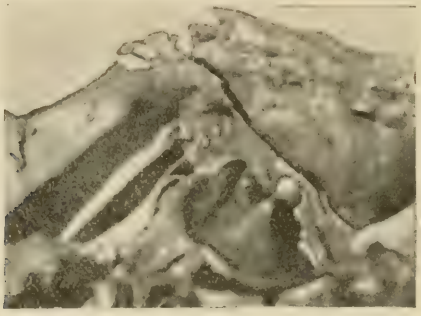

Fig. 4.

neck of the hammer, and also shows, alas, but too distinctly, the line of accidental fracture through the membranous tegmen just mentioned. The rounded surface of the promontory is also well shown.

Before closing this paper I desire to express my sincere thanks to Dr. B. Alexander Randall, of Philadelphia, who, while recently on a visit to this city, most kindly volunteered to take for me a number of photographs of the specimen. Two of these photographs were selected by me for use in this paper, and engravings from them are given in Fig. 2 and Fig. 4. These two views were exceptionally difficult subjects for the camera, and, as usual, the process of engraving does imperfect justice to the excellence of the photographic work. Fig. 1 is from a photograph made by Thomas of 717 Sixth avenue, and Fig. 3 from one made under my supervision by the photographer at the College of Physicians and Surgeons. I desire also to express my thanks to Prof. Allen of the Central Park Museum, and to other gentlemen connected with that institution, for kind attention and courteous assistance offered on the occasion of my visits there.

REPORT OF A CASE OF FRACTURE OF THE MALLEUS HANDLE WITH LUXATION AT THE INCUDO-STAPEDIAL JOINT.

By Neil J. Hepburn, M. D., *New York, N. Y.*

On September 4th, 1886, Dr. Charles D. Scudder requested me to examine a patient who gave the following history: One morning early in the previous July while feigning sleep, his little son was tickling his ears in the endeavor to awaken him. Suddenly he experienced very severe pain in the left ear, and some hemorrhage occurred. It was ascertained that the boy had thrust a hairpin into the meatus, and through the membrana tympani.

The pain was not of long duration, and the sanguinolent discharge disappeared in the course of a week, but the hearing, which was said to be perfect before the accident, was nearly abolished.

Under Dr. Scudder's care the drum-membrane had apparently healed, the posterior quarter being replaced by a pseudo-membrane, but the hearing was only slightly improved. The patient's right ear was the seat of an old otitis.

On examination I found the membrana tympani presenting a sunken appearance, the short process very prominent, and the malleus handle apparently twisted. No opening was visible in the membrane but a curious line extending obliquely across the malleus handle from below upward and backward near its extremity. On inflating there appeared a false point of motion where this line crossed the bone. The diagnosis of fracture was made,

and the patient advised to allow the ear as absolute rest as possible.

H. D. R. w. 12″.

H. D. L. w. ½″.

I had the opportunity of observing the case subsequently at intervals of from one to three weeks and on March 14th, 1887, the hearing was

H. D. R. w. 40″.

H. D. L. w. 4″.

Discharge ceased in right ear, and a small perforation. In left ear the slit-like cicatrix had become an oval opening and the club-shaped end of the malleus handle had almost disappeared. Through the opening in the drum-membrane could be seen a dislocation of the incudo-stapedial joint, which had probably occurred at the time of the accident. The bones in sight were necrosed, as was ascertained by touching them with a probe. The patient, declining to have them removed, ceased treatment.

The accompanying illustrations may serve to give some idea of the appearances spoken of. The first (Fig. 1)

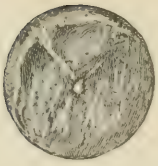

Fig. 1.

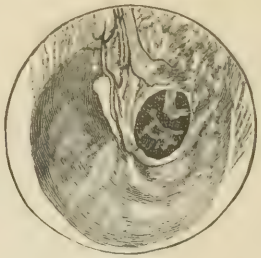

Fig. 2.

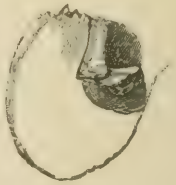

Fig. 3.

was a sketch taken hurriedly at the time of the first visit by myself. Fig. 2 is a representation of the appearances at the end of treatment, and Fig. 3 is a magnified view of the incudo-stapedial articulation.

Figs. 2 and 3 are from drawings kindly made from life by Dr. J. O. Tansley, of this Society.

ANEURISM FIRST RECOGNIZED IN THE FUNDUS OF THE EAR, LATER APPEARING IN THE NECK.

By Charles A. Todd, M. D., *St. Louis, Mo.*

May, 1880, Mr. C., merchant, 45 years old, consulted me on account of pain in the left ear, and other symptoms suggesting furuncle. He stated that in 1858 he had severe otitis media in both ears for one week, when a discharge appeared, and the pain ceased: hot poultices were used to relieve the pain. The discharge after a while ceased of itself. Some deafness has existed ever since this attack. There had been no previous ear disease. During the Civil War he served in the infantry, and was exposed a good deal to wet in the trenches: thinks he contracted pharyngeal disease. He has chronic pharyngitis.

In 1876 was examined by a skillful specialist on account of steady impairment of hearing: catarrh of the tubes was diagnosed. He has had no earache since 1858.

For the past seven or eight years he had noticed a pulsating sound: at first seemingly in both ears, but now located in the left.

On examination of the left ear I saw a circumscribed swelling on the floor of the meatus just in front of the membrana and entirely concealing it: it was soft and fluctuating to the probe. On filling the ear with water no distinct intra-aural pulsation could be seen.

I rather hastily concluded that Mr. C. was suffering

from a furuncle, although the site was a strange one. In defence I ought to state that on the first visit a very imperfect history was given and suggested nothing but a circumscribed abscess. Accordingly, I lanced the swelling, the knife going to the bone with unexpected ease. A free gush of blood promptly followed, and some three ounces were lost before the flow could be stopped by tamponing. The nature of the tumor was made plain; no pus whatever was seen. It was not until after several days that the tampon could be finally removed. Compression by tampons was resorted to and advised to be continued at home, as he could not remain in St. Louis.

August, 1880, a note from Mr. C.'s physician informed me that the treatment by compression had effected but little, if any, good: that Mr. C. suffered from the pulsating noises, sometimes not being able to sleep. I advised ligature of the common carotid if the symptoms were of sufficient gravity. Electrolysis seemed too dangerous.

March, 1883, Mr. C. again consulted me. Electrolysis had been tried with alleged diminution in size of the tumor. He declared himself unable to attend to his business on account of the pulsation in the ear, the least exertion greatly aggravating the noise. Ligation was advised as a last resort.

March, 1890. The aural tumor as before, but now a large aneurismal swelling appears on the neck, just below the ear, and to some extent in front of the lobe. I referred him to a general surgeon, but have heard nothing more from him.

PERMANENTLY GOOD RESULTS OF EXCISION OF THE MEMBRANA TYMPANI AND MALLEUS IN A CASE OF CHRONIC AURAL VERTIGO: ALSO IN A CASE OF CHRONIC SUPPURATION OF THE TYMPANIC ATTIC.

By Charles H Burnett, M. D., *Philadelphia, Pa.*

As two years and more have elapsed since the first of the two cases I narrate was operated upon, and a year in the second case, I have considered the results as worthy the attention of this Society: because, no matter how good the immediate result of any operation may be, a just estimation of the operation and its results can be formed only after the lapse of considerable time.

The case of chronic aural vertigo was operated upon in May, 1888, and a report of the case and the operation was read at a meeting of this Society, in July, 1888. Briefly recapitulated the case was as follows:

Miss D., aged 31, was first seen by me in November, 1881, the case being diagnosed as one of chronic catarrh of the left middle ear, attended with annoying tinnitus and with hearing of only six inches for isolated words. All usual methods of treatment for such cases failed to relieve the deafness and tinnitus.

There was no aural vertigo at that time. I lost sight of the case for six years, when I received a letter from the patient stating that she was suffering greatly from tinnitus in the left ear and frequent attacks of severe vertigo, which at times obliged her to cling to a lamp-post or a similar object when she was attacked by vertigo in the street.

Upon inspection of the ear in May, 1888, it was found that the malleus was adherent to the promontory, and the constant retraction of the chain of ossicles thus produced, was deemed the cause of the tinnitus and vertigo.

The patient was etherized and the membrana tympani and malleus excised. The tinnitus and vertigo ceased immediately and have never returned. A new membrana tympani formed in this case in the course of two months and has persisted to the present time. The hearing has remained unchanged.

A letter from the patient a few weeks ago informs me that her health and strength, previously impaired, are now excellent, that the ear remains free from subjective noise, and that the vertigo has never returned. More than two years have elapsed since the operation which gave the relief. As far as I can discover, this is the first case of chronic aural vertigo (so-called Ménière's symptoms) reported as cured by an operation such as I have described. The case furthermore proves the mechanical origin, and not a neuropathic one, of many cases of so-called Ménière's disease,—a point I have long contended for.

The second case was a typical one of that inveterate class, known as "attic disease," in which a chronic suppuration in the tympanic attic has its only outlet through the membrana flaccida, and in my experience always bids defiance to all modes of treatment heretofore proposed for its cure.

This case came under my observation two years ago, and gave the following outline of history:

The patient, a young lady of twenty-three, stated that she had had some catarrhal symtoms in her nose, throat, and ears in childhood, and that the tonsils were deemed worthy of excision, and this was followed by earache and dullness of hearing in both ears. These latter symptoms soon wore off and were forgotten, excepting that the right

ear, the one now suppurating, never heard well after the excision of the tonsils.

In 1882, six years before first consulting me, suddenly and without any previous warning of any kind, the right ear felt *stopped*. She says that examination by her physician at that time revealed a polypus in the right ear. The polyp was removed, and since then there has been a slight, nearly constant, offensive discharge from this ear, but hardly enough to flow from the meatus. In the meantime numerous polypi have been removed from this ear, probably from the region of the perforation in the membrana flaccida, by surgeons in this country and in Europe, but no permanent relief has followed these operations. This want of success was due to the fact that the treatment had been one of symptoms and not of the disease itself, which in reality was a necrosis of the head of the malleus, as shown by the operation I performed.

At the time I first examined the case the hearing in the affected ear was *nothing*. The membrana vibrans was found intact and dry, retracted, white, and shining; in the membrana flaccida there was a large perforation, through which the white neck of the malleus could be seen, and from which a scanty, sticky, offensive discharge came, clinging mostly to the upper wall of the external auditory canal. I, too, then proceeded to treat symptoms, as my predecessors in the case had done, and for one year I applied all known rational means of treatment to the case, by antiseptic injections into the attic cavity with the tympanic syringe, and by snaring off small polypi from time to time as they appeared around the perforation: but all without any good result, simply because I had not reached and could not get at the true disease in the attic, so long as the membrana tympani and the malleus barred the way.

Therefore, on July 29, 1889, the patient was etherized, and under illumination of the auditory canal by means of

the electric head-lamp as devised by the River and Rail Electric Light Company of New York for Dr. Sexton. the membrana tympani and the malleus were excised. The head of the malleus was found half destroyed by necrosis in its free anterior portion. its articular surface with the incus being normal. The other ossicles were not seen, but as far as could be decided by the probe, there were no necrotic spots anywhere else within the tympanic cavity,— an opinion which was strengthened by the speedy healing of the diseased region after the operation.

Here, then, was the cause of the previously incurable purulent discharge from the attic space. The ligaments about the neck of the malleus were very tough and broad, and had acted as a diaphragm between the attic and the atrium, and also as the floor of a sinus running from the diseased malleus to the perforation in the membrana flaccida.

The steps of the operation of excision consisted in:

1. An incision behind the short process, with a slender blade.

2. Through this initial incision a round-pointed blade, curved in the plane of its broad surface, was introduced, and being kept close to the manubrium, below the insertion of the tendon of the tensor tympani, was pressed upward against the latter, and the tendon thus severed.

3. Then a straight blade, with rounded blunt end, was used to cut around the membrana tympani in the annulus tympanicus, thus entirely detaching it, and severing the hammer ligaments at the neck of the bone.

4. Instead of forceps the polypus snare was now used to seize the malleus, being passed around the manubrium, and the malleus with the membrana tympani was removed from the ear.

The slight hemorrhage was controlled by mopping the fundus of the ear with a 4 per cent. solution of cocaine muriate. During the operation the fundus of the ear was

mopped frequently with a 2½ per cent. solution of carbolic acid. After the operation the meatus of the canal was lightly tamponed with cotton sprinkled with iodoform, and left in place for twenty-four hours.

The next day the patient went about the house. The cotton tampon was slightly discolored on its inner end with a pinkish serum. There was no purulent discharge and there has not been any since the operation, nearly twelve months ago.

The iodoform tampon in the auditory canal was discontinued in four or five days, and one containing powdered boric acid sprinkled over it was substituted and worn for a week longer. Then simply a little cotton pellet was worn in the meatus, in the open air, to protect the exposed tympanic cavity. On some days the tampon was a little moistened with a serous fluid, but this soon ceased to appear. The absence of any reaction and the tendency to rapid healing in this case I am disposed to attribute largely to the antiseptic measures during and after the operation.

By August 12 there was no discharge of any kind from the ear. The hearing was found to be a little improved,—about a foot for loud words.

August 19. Still no discharge. The mucous membrane of the promontory is pale and rough, but entirely dry. The region of the membrana flaccida is narrowing. Hearing equals a whisper at six inches.

The patient now went on a tour to the Adirondacks, *free, for the first time in seven years, from the annoyance of a running from the ear and the care it demanded.*

The patient was not seen again until September 25th, when it was found that a new membrane had formed from the segment of Rivinus, the region of the membrana flaccida, down to the promontory. There was no discharge. The hearing was, for whispered words, two to three feet.

October 11. The delicate membrane, bluish and transparent, rises and falls under gentle suction with the pneumatic speculum. The hearing is *nine feet* for isolated words in ordinary conversational tone.

At the present time the hearing is fifteen feet for whispered words.

Here, therefore, is offered an account of a case of chronic purulency and deafness, caused by necrosis of the head of the malleus and altered tension and conductivity in the ossicles, cured of the discharge and the deafness by excision of the useless membrane and a necrotic malleus. The cure of the purulency is easily explained, but the improved hearing is not as easily explicable. I venture to suggest that the conducting power of the ossicles was interfered with by the presence of pus about the ossicles in the attic, and by the pathological bands about the malleus already mentioned, which prevented ready vibration. Also the diseased condition of the head of the malleus loosened its articulation with the incus, and impaired its leverage on the latter. Hence, a wave of sound falling on the membrana and malleus could not transmit its inward oscillations to the incus and thence to the stapes and the labyrinth.

When the membrana tympani and the necrotic malleus-head were removed from the attic, waves of sound fell directly upon the incus and the stapes and were conveyed to the labyrinth. As the new membrane formed and rested against the ossicles remaining, its expansion offered a broader surface to the waves of sound, and possibly helped to increase their leverage on the remaining ossicles, thus transmitting more sound and increasing the hearing. The continuence of this normal stimulus to the movements of the stapes in the oval window gradually overcame the partial ankylosis which had ensued at that point from disuse, and the hearing, in consequence, has *steadily improved* since the operation from nothing to *fifteen feet for whispers*.

Let us suppose that the chronic purulency of the attic had been, or could have been, cured by injections through the perforation in the membrana flaccida into the attic cavity. The hearing would not have been improved, because the impaired malleus-head and the pathological bands around the neck of the malleus would not have been removed, and hence the impaired mobility of the incus and stapes would still have remained as a hindrance to hearing.

We see, therefore, that the operation of excision of the membrana tympani and the malleus offers not only a great means of curing chronic purulency, especially of the attic, but also of relieving deafness due to a stiffened membrana and ossicles, by the removal of pathological bands prohibiting free oscillations in the ossicles, and by thus permitting sound waves to fall directly upon the stapes in the oval window.

FURTHER NOTES ON THE SHRAPNELL PERFORATION.

By B. Alex. Randall, M. D., *Philadelphia, Pa.*

At the last meeting of this Society I presented some notes of cases of suppuration in the tympanic "attic" with perforation in the flaccid membrane, for the purpose of supporting the claim that these lesions are not rare. This seemed done in noting fifteen cases among my last five hundred ear patients, and citing a total of 120 cases among some ten thousand patients in various clinics: and I had thought to let the question alone. The publication of my paper at the close of the year was followed, however, by some criticism of this point: so again about New Year I began to make regular note of these cases as they presented themselves. My clinic records, I am ashamed to say, often preserve no notes on these points: and a study of them would indicate very few cases of this kind as occurring during the latter half of 1889. Yet my private notes, though very fragmentary, record several as presenting some specially notable features, while my memory assures me that there were others: still, as eight of the nine cases which I have seen in private practice came under observation (some certainly as fresh lesions) in the earlier half of the year, I am quite ready to concede that this is the more favorable time to observe the affection in question; and I shall this year make a point of carrying the observation throughout the entire year. For the twelve months since my other paper, there will be no over-statement, at least, of

the frequency of the lesion, if we accept the cases which follow as if they were the total number occurring among about one thousand patients.

As before, only such cases as had purulent discharge have been noted, taking no account of dry openings or cicatrices. The date given is in a few instances not that of the first record, but of the visit when the Shrapnell opening was first certainly recognized.

SHRAPNELL PERFORATION CASES IN FIRST HALF OF 1890.

Jan.	8.	Polyclinic,	263,	Horace A.,	aged 8, left.
	14.	Episcopal,	1116,	Jacob W.,	aged 50, left.
	24.	Polyclinic,	296,	Annie McG.,	aged 19, both.
	31.	Episcopal,	1133,	Ida P.,	aged 12, left.
Feb.	4.	Episcopal,	1137,	Amelia W.,	aged 13, left.
	13.	Polyclinic,	314,	Adam M.,	aged 24, right.
	14.	Episcopal,	1148,	John McA.,	aged 29, left.
	19.	Private,	117,	William P.,	aged 30, left.
	19.	Children's,	206,	Jennie D.,	aged 15, right.
	21.	Episcopal,	1153,	Thomas K.,	aged 18, left.
	21.	Episcopal,	1156,	John H.,	aged 50, right.
March	4.	Private,	120,	Michael B.,	aged 15, right.
	(12.)	Children's,	310,	Laura R.,	aged 7, left.
	13.	Polyclinic,	342,	Violet H.,	aged 9, left.
	14.	Episcopal,	1167,	Sally C.,	aged 20, both.
	(15.)	Polyclinic,	140,	Albert L.,	aged 12, right.
April	8.	Episcopal,	1192,	Edward B.,	aged 18, left.
	26.	Children's,	232,	Mary M.,	aged 13, left.
May	(10.)	Private,	85,	Bessie C.,	aged 13, right.
	4.	Private,	132,	John G.,	aged 15, right.
June	4.	Polyclinic,	421,	Alfred M.,	aged 33, left.
	7.	Polyclinic,	428,	Frances E.,	aged 16, left.
	12.	Polyclinic,	434,	George McC.,	aged 14, left.

IN LATTER HALF OF 1889.

Aug.	12.	Episcopal,	963,	George P.,	aged 69, right.
	22.	Polyclinic,	149,	Annie G.,	aged 44, right.
Oct.	21.	Polyclinic,	179,	James L.,	aged 64, right.
Nov.	8.	Episcopal,	1052,	Alex. E.,	aged 13, left.
	11.	Episcopal,	1057,	Louise W.,	aged 12, left.

The histories of these cases are as follows:

Case I.—Horace A., aged 8, came to the Polyclinic Jan. 8th, with a long-standing otorrhœa on the left and the canal filled with polyps. These were removed with increasing completeness at several sittings, until the fundus could be seen with a perforation above the short process and the roots of the polyps in the upper posterior quadrant. The upper wall of the canal was pressed downward, and at his next visit pus was pointing behind the auricle,—apparently a case of sub-periosteal burrowing from the Rivinian segment. Incision, syringing, and drainage gave little benefit: so after a week fuller exploration was made under ether, and a sinus was found in the mastoid leading into the antrum. It was enlarged to admit a drainage tube and syringing with the peroxide of hydrogen continued. Healing was secured in about two months—leaving a dry open perforation in Shrapnell's membrane, and a depressed cicatrix up and back, which clearly reveals the stapes and its tendon with apparent loss of the incus (Fig. 7). He hears a loud whisper at ten feet. Suppuration on the right has followed a later cold-taking, but the left has remained unaffected.

Case II.—Annie McG., aged 19, came to the Polyclinic Jan. 28th, with suppuration of both ears. Inspection showed on the left a large loss of substance of the Rivinian margin, uncovering much of the head of the malleus (Fig. 8), with a slight discharge beneath the leathery crust which had covered the region. On the right there was free discharge from a perforation involving all the central portion of the flaccid membrane and a smaller opening in the anterior lower quadrant. Discharge had ceased when last seen, some weeks later.

Case III.—Adam M., aged 24, came to the Polyclinic Feb. 13th, with free discharge from a reniform perforation below the manubrium tip. A small perforation in the

posterior part of the flaccid membrane was also discharging (Fig. 3). Peroxide syringing, with the routine dry treatment, led to prompt cessation of the discharge.

Case IV. — Albert L., aged 12, had with his sister been under treatment at the Polyclinic since Aug. 16th, '89, for chronic suppuration of the middle ear. A perforation below the umbo was the source of most of the discharge: but as this decreased, this lower perforation became dry, and in March of this year an opening above the short process (Fig. 4) was seen to be the source of the trace of pus which still collected in the fundus. Peroxide syringing has brought this to a stand-still.

Case V. — Violet H., aged 9, was brought to the Polyclinic on March 13th, with suppuration of the left ear of two weeks' duration. There was a small dry sinus behind the lobule, and inspection showed that there had been considerable loss of substance of the outer part of the bony floor of the canal. Cicatrization was good and confirmed the history indicating that the trouble had been over at this point for several years. The tympanic membrane was retracted without visible perforation, and inflation gave no whistle. A month later it was still running and the opening in Shrapnell's membrane could be clearly seen, though the region was difficult to study. Suppuration soon ceased and has not recurred during the past months, during which the hearing of both ears has been improving under inflations.

Case VI. — Frances E., aged 16, was brought by her attending physician to the Polyclinic on June 7th, with considerable constitutional disturbance, decided swelling above and in front of the ear, and the meatus blocked with furuncles, on the left. After removal of the pus and evacuation of the furuncles, a Shrapnell perforation was seen anteriorly. This was syringed with the peroxide, and a guarded prognosis given, as subperiosteal burrowing

was suspected. A week later the doughy fullness above and before the auricle was gone, the meatus nearly normal, and only a trace of discharge from the fistule. This has apparently ceased now. On the right there is a foramen Rivini or a tiny depressed scar.

Case VII.—Alfred M., aged 33, came to the Polyclinic on June 4th, suffering with an otorrhœa on the left of six months' duration. When first seen by me at the end of the month, the discharge was only sufficient to cake the boric powder used several days before, and removal of the masses so formed showed a cicatrized perforation just behind the manubrium and an open and still moist fistule in the flaccid membrane.

Case VIII.—George McC., aged 14, came to the Polyclinic on June 12th, with a chronic discharge from the left ear which was found upon investigation to come from a small Shrapnell opening and a larger reniform gap below and behind the umbo.

Case IX.—Annie G., aged 44, came to the Polyclinic Aug. 22d, '89, with a purulent discharge of long standing on the right. Cleansing showed a small reniform opening down and back, and a polyp protruding through a perforation above the short process. Further details are lacking.

Case X.—James L., aged 64, was seen at the Polyclinic Oct. 21st, '89, complaining of a chronic suppuration of the left ear and a discharge for two months without pain or deafness on the right. Removal of the scanty secretion on the right showed a perforation in the posterior part of the flaccid membrane. No further details.

Case XI.—Jennie D., aged 15, came to the Children's Hospital on Feb. 19th, with profuse double otorrhœa which had been treated for months without even arresting the increasing deafness. Cleansing and removing the protruding polyps showed the region of each drum-mem-

brane filled with tough fibrous masses, generally arising by broad bases from the annulus, and their removal was painful and almost impossible. She was etherized at her next visit and these masses removed with the curette, uncovering dead bone almost throughout the fundus below. This was scraped as freely as seemed safe. The malleus was in situ on each side, and a sinus was present in the right flaccid membrane, uncovering a rough area on the neck of the ossicle. Some improvement followed the scraping and a part of the area before carious has cicatrized well: but the disease is hardly checked, and a large sequestrum is evident below and in front on the right, not yet removable. On the left the gain is less.

Case XII.—Mary M., aged 13, came to the Children's Hospital on April 26th, with a history of recurrent otorrhœa and deafness. On the left there was some inspissated pus and its removal showed a small polyp on the lower anterior part of the membrane, without discernible perforation: while above the short process the removal of a leathery scale, purulent on its inner side, revealed a carious area of the malleus neck through a considerable gap. The malleus head seemed wanting: but the patient grew so faint that further study was deferred. She has not returned as directed.

Case XIII.—Laura R., aged 8, has been coming to the Children's Hospital from time to time with recurrences of suppuration of the middle ear since her first visit in September, '88. The disease dated from measles in the preceding May. When first seen there was a very large perforation of the lower posterior part of the membrane. In March of this year she came with the discharge from the posterior opening, — now much smaller, — and also from an opening above the short process (Fig. 5). Prompt cessation, with no return to date.

Case XIV.—Jacob W., aged 50, came to the Episcopal

Hospital on Jan. 14 complaining of severe pain in the left ear for a week, with throbbing and tinnitus. There was slight muco-purulent discharge coming from a small pouting perforation in Shrapnell's membrane. Prompt recovery under routine measures.

Case VI. — Ida P., aged 12, came to the Episcopal Hospital on Jan. 31st, complaining of impaired hearing. The record merely notes tubal obstruction with marked retraction of both membranes. Suppuration occurred a couple of months later, as to which I have no record except my sketch of April 23d (Fig. 2), which showed the lower perforation closed by a depressed cicatrix, while the Shrapnell perforation was still open and, if my memory is not at fault, was still discharging slightly. All flow soon ceased and has not recurred.

Case VII. — Amelia W., aged 13, was first seen Feb. 4th at the Episcopal Hospital with double otorrhœa of a year's duration. Cleansing showed the discharge to come from the flaccid membrane on each side, — the remainder of the drumhead being intact. Cessation of the discharge speedily followed and it has not returned.

Case VIII. — John McA., aged 29, came to the Episcopal Hospital on Feb. 14th, with a leathery scale covering the upper pole of his left tympanic membrane, which was found moist with thick yellowish pus on removal, and uncovered a discharging perforation above the short process. There was Eustachian obstruction and decided deafness, gradually relieved by inflation and naso-pharyngeal treatment, and the discharge, after forming a few renewals of the crust, ceased entirely.

Case VIII. — Thomas K., aged 18, came to the Episcopal Hospital on Feb. 21st, with a chronic otorrhœa on the left, coming from a lower posterior and a Shrapnell perforation. No further note beyond the sketch.

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

Case XIV.—John H., aged 50, came at the same time as the preceding case, with a history of watery discharge from the right ear for several days, changing the day before into pus. There was a minute opening in the flaccid membrane,—none elsewhere. Flow soon ceased under routine treatment.

Case XV.—Sally C., aged 20, came to the Episcopal Hospital on March 14th, complaining of deafness and long continued discharge from both ears. There was a little pus at the bottom of each canal and the upper anterior part of membrane and meatus wall on each side was hidden by inspissated material. On removing this a small perforation was revealed above the short process on the left, while on the right the opening involved all the central part of the flaccid membrane and uncovered the neck of the malleus (Fig. 1). Some relief was promptly gained, and she has slowly gained ground since. No crust had formed when last seen.

Case XVI.—Edward B., aged 18, came complaining of profuse otorrhœa on the left, to the Episcopal Hospital on April 8th. The canal was filled by a large polyp and its removal was not complete until his second visit, when a considerable loss of substance above the short process was recognized. No bare bone was felt, although a portion of the Rivinian margin seemed lost, and cauterization of the root of the polyp, with routine dry treatment, led to cure with very gratifying rapidity.

Case XVII.—Louisa W., aged 12, whose first record at the Episcopal Hospital, on Nov. 11th, '89, notes pain, deafness and chronic discharge on the left, returned in February with recurrent discharge coming from a Shrapnell perforation, not before recorded, if seen. She came but a few times, the progress probably having been favorable and no record made.

Case XXIII.—George P., aged 69, came to the Episcopal Hospital on Aug. 12th, with both auditory canals impacted with material which appeared ceruminous. On its removal, a large rounded loss of substance was found in each Rivinian region, exposing the attic and a part of the malleus head (Fig 6). The epidermal flakes which packed the openings were moist on the left, and there were granulations on the neck of the malleus. His hearing was much improved by the cleansing and he has not been since seen.

Case XXIV.—Alexander E., aged 13, came to the Episcopal Hospital on Nov. 8th, '89, with a history of discharge from both ears for a year. The right ear proved dry, with a cicatrix above: but on the left there was an open Shrapnell perforation and a large opening below showing the promontory covered with granulations. There was still some discharge when last seen early in '90.

Case XXV.—Michael B., aged 15, was seen in consultation with Dr. George Wise on March 4th, suffering from double chronic otorrhœa. There was a medium-sized posterior perforation on the left, and on the right a larger irregular opening below, with a suspicious swelling at its rear margin, and a loss of the central part of the flaccid membrane above. Carious bone was not certainly felt in either situation and only routine cleansing with boric insufflation was advised. The result has not been learned.

Case XXVI.—Bessie C., aged 13, was brought to my office in May, '89, with a chronic suppuration of the right middle ear, present with remissions since scarlatina some years previous. There was a considerable central perforation and the manubrium looked shortened as if by loss of its tip. Discharge was free, but tenacious and foul, and cleansing rather difficult. Two treatments, with intervening syringing and boric insufflation, reduced the discharge to a mere odorless trace; and she returned but once or

twice in the next few months. About May 1st she was seen again, the discharge having become noticeable, and a few treatments totally dried the ear except for a thread of muco-pus which could be drawn out of the now recognizable Shrapnell perforation. This was hardly sufficient to form a crust when she left the city for the summer. The hearing is almost perfect.

Case XVII.—John G., aged 15, was sent to me on May 4th, because of eye-strain and near-sight. Examination being hampered by his defective hearing, I examined his ears, which had long been discharging slightly, and found both membranes to have central perforation, while on the right there was a discharging opening above the short process. Both membranes showed chalk deposits. He has not returned since the one treatment, but is reported free from all trouble.

Case XVIII.—Wm. S. P., aged 30, came to me on Feb. 19th, suffering with sub-acute suppuration of the left ear of several weeks' duration, and chronic on the right. The pain had been rather severe during the height of his recent attack, but his principal trouble was the variably impaired hearing, which interfered much with his business as a traveling salesman. The right ear showed two swellings at the posterior margin of the membrane, almost hiding this structure: and the probe found a small opening close behind the malleus handle in which a spicule of sequestrum was felt. This was removed, but bare bone can still be felt on the Rivinian margin. Little discharge now, and hearing generally good. On the left there was bagging up and posteriorly, apparently a little external to the drum-membrane, and a tiny sinus could with difficulty be entered at its apex. No bare bone to be felt at first. Enlarging this opening and syringing with peroxide and dilute acid solutions has accomplished little as yet, except that the sequestrum which was soon discovered, is smaller,

freer, and more accessible: — apparently it is the Rivinian margin. A sinus opened in the Rivinian region about May 1st, through which the sequestrum was first certainly felt, and part of the gristly prominence was cut away so as to unite the two openings. Syringing of the lower opening has always passed freely into the pharynx; but even since the two perforations have been thrown into one, the attic can be syringed vigorously without the fluid reaching the Eustachian tube.

It will be seen from the foregoing notes that twenty-three cases have presented themselves since the first of this year and that at least five others were seen and recorded during the latter half of last year.[1] The total number of ear cases coming between Jan. 1st and July 1st has been a little under six hundred. Even if the three patients who had been seen during 1889, though not then recognized as belonging to the group under discussion (if indeed they then had the lesion), are counted to the preceding year, there still remain twenty cases occurring among five hundred in the half year, — a percentage of four per cent. Taking the entire eighteen months embraced within my two reports (although I may again urge that the record is incomplete), we have more than forty cases among sixteen hundred, — nearly three per cent. That this is an exceptionally high proportion, I very much doubt: although I am not at all so sure of the habitual thoroughness of my work as to be confident of recognizing as full a number in the future, when not looking for them with scrupulous care.

A word as to treatment. The intra-tympanic syringe has been, and promises to remain, my stand-by. Cases will probably occur in which a reasonable trial of it will fail of success; and in these I will try excision, as I have

[1] Seven additional cases were seen during August and one on September 2d, 1890.

done. But I expect to reserve it for an extreme measure: and while it may in the future prove far more valuable than in the few instances where I have employed it, the fair success which has followed the use of less radical measures will make me slow to urge it upon an unwilling patient. The syringe, then, with the peroxide and weak solutions of the mineral acids, are the measures which I would commend. Not a little has been said about the way in which these should be employed: much of it is probably wasted caution. Any smoothly working syringe, such as an Anel, with the hollow lachrymal probe (No. 3 Bowman), makes an instrument far superior for my use to anything I have seen or tried, — not even excepting Dr. Blake's excellent special syringe. Most of the canulas offered are better suited for Eustachian catheters — being several times as large as the openings which they ought to enter. Daily use for years of the same instruments has failed to show any deleterious action of the solutions upon the metal of syringe or canula — the soft virgin silver giving way only after long hard usage.

Summarizing the results in these twenty-eight cases, we find that three of them occurred in children under ten years of age, eleven in patients of fifteen or less, and only nine were in adults. Nine were on the right side, sixteen on the left, and three on both, although in several more the opening was present but dry, on the other side. In fifteen cases the perforation was in the Shrapnell membrane alone, while in the remaining thirteen there was a second perforation below.

Few of these cases showed unmistakable caries of the ossicles or Rivinian margin, but apparent recovery was very prompt even in one or two which were not doubtfully the seat of such a lesion. The question of excision of the malleus has occurred in only two or three as at all to be considered. None have been so treated.

Some further notes of the cases previously reported may be of interest.

Case I. had various relapses, and excision of the membrane, malleus, and incus was done on the right, the ossicles proving extensively carious (as the specimen presented shows) and buried in granulations. Bare bone above was lightly curetted and gradual improvement has followed: with return of moderately good hearing for the voice: but a sequestrum could be felt in the attic at his last visit. The left ear has remained quiet.

Case II. soon discontinued treatment unimproved,—scared off perhaps by a hint at excision.

Case III. underwent excision of the membrane and malleus without apparent gain: a new membrane formed with a large central perforation, and a new sinus has opened above. The malleus as removed had lost its head, the neck being carious, and no trace of it or of the incus could be felt. The specimen is presented.

Case V. was recently seen, having suffered no recurrence.

Case VI. has had a severe bilateral relapse, which destroyed most of the cicatricial right *membrana tensa;* but matters have returned to the *status quo*.

Case VII. has had one slight recurrence of suppuration, involving the left attic as well as the atrium of each. Now dry, with a "foramen Rivini" on the left.

Case XI. after ten months of quiet, had double acute otitis media, not at first involving the attics; but as the trouble below subsided, discharge again broke out from both Shrapnell perforations, with renewed caries on the right. He is much better again, with good hearing, after a month or more of treatment.

Case XIV. has had no further tympanic trouble—only a "foramen" remaining.

Case XVI. was lately seen, with a dry perforation partly

cicatrized. Deafness has rather increased under treatment by her medical attendant.

The other twelve cases have not been seen since the previous report.

DISCUSSION.

THE PRESIDENT: — There are two phases to the discussion. One, the removal of the ossicula in what may be called old or dry catarrh, the drum-membrane being intact. The other phase of the discussion is the propriety of the removal of the ossicula and drum-membrane in cases of suppuration of the middle ear. We all would like to hear from Dr. Blake.

DR. C. J. BLAKE: — Having had the misfortune not to hear the papers read I should be glad to listen to remarks from the other members, but as the subject is one of great interest to us all, I shall be happy to open the discussion if the President wishes it. First, the question of the excision of the drum-membrane and ossicula in chronic non-suppurative disease of the middle ear. So far as my personal experience is concerned, I have never excised the membrana tympani or malleus and incus in cases of chronic non-suppurative disease of the middle ear for the relief of tinnitus aurium or vertigo, because I have never yet met a case in which it seemed advisable, in place of other treatment, to undertake so serious an operation for such a purpose. In that form of chronic disease of the middle ear which has the most decided effects in the way of fixation of the ossicula, the result of this fixation being, in addition to the impairment of hearing, the production of tinnitus aurium by interference with the passage of sound outwards, as Dr. Theobald has shown, mobilization of the stapes and the membrane of the fenestra rotunda, would

result in diminution of the tinnitus aurium, and, if sound from without is allowed to reach the stapes, an increase of hearing for sounds aerially conveyed.

In all the discussion that I have seen with reference to this operation in chronic cases one factor in the fixation of the bones has not been taken sufficiently into account, and that is the influence of the thickening of the lining membrane of the middle ear. Following the original investigations of Toynbee and those recently published by Politzer with reference to the presence of reduplications of the lining membrane in the upper part of the tympanic cavity, Dr. William S. Bryant, of Harvard Medical School, has during the past year at my suggestion examined 116 temporal bones with reference to this point and found reduplications of the mucous membrane in the horizontal plane in over eighty per cent. This is a larger percentage than I had found in a series of investigations made fifteen years ago. There were also found the well marked series of folds in the neighborhood of the stapes described by other observers.

If the object of the removal of the membrana tympani and the malleus and the incus in these cases of chronic thickening of the lining membrane of the tympanic cavity is to free the stapes and the membrane of the fenestra rotunda from the interference with their mobility and to render mobilization of these parts more easy, so extensive an operation seems unnecessary in view of the fact that we can accomplish the same object in a simpler manner, allowing the malleus and incus to remain in place.

Make an opening, as Miot proposes, in the posterior superior quadrant of the membrana tympani, divide the articulation of the incus and stapes, the tendon of the stapedius, and such adhesions as may be found about the stapes in its niche, and in the neighborhood of the round window. The result, so far as I have observed in the

few cases operated upon, has been that as soon as division of the incudo-stapedial articulation has been effected, the contraction of the tensor tympani muscle, left intact and no longer counteracted by the tension of the membrana tympani and the resistance of the stapes, pulls the descending process of the incus past the head of the stapes: the stapes is now as much freed from contact with the malleus and incus and from the pressure which these bones would exert in effecting immobilization of the stapes as if they were bodily removed.

The next step in the operation — division of the tendon of the stapedius and of the mucous folds, almost invariably present — still further frees the stapes and separates it from the incus.

One important question in these operative cases has reference to the decided tendency to closure of the opening in the membrana tympani, even in the adult and where the opening is large, and to growth of the cicatricial tissue inwards. The utilization of this latter tendency has been made the subject of experiments not yet published, but sufficiently carried out to show by increased hearing for high tones and other evidences of mobilization of the stapes, the influence of a larger sound receptive vibrating surface transmitting its movements directly to the stapes, similar results being obtained by an incision in the posterior quadrant of the membrana tympani of such shape as to make a sharply angular or curved flap, the edge of which was brought in contact with the long process of the incus and, in one case, with the head of the stapes, and allowed to become united. These experiments when made were more physiological in their purpose than with any view to the mobilization of the parts.

In two cases of chronic catarrhal inflammation of the middle ear, with a high grade of deafness for sounds aerially conveyed, bone conduction remaining good,

recently operated upon with a view to improving the hearing, an incision forming a flap in the shape of an isosceles triangle with the base upwards was made in the posterior portion of the membrana tympani: through this opening the tendon of the stapedius was divided and the stapes mobilized as proposed by Kessel, the point of the triangular flap being then brought in contact with the head of the stapes and so maintained by suitable aseptic dressing with a view to permanent union of the parts. The opening in the membrana tympani closed in both cases, however, without effecting this purpose, but there was nevertheless slight improvement of hearing. As this class of cases seems to bear surgical interference well, it is possible to make an opening in the posterior portion of the membrana tympani for the purpose of operating and for the mechanical mobilization of the stapes with very little risk under aseptic conditions, the opening being subsequently allowed to heal. Disarticulation from the stapes implies, of course, either a large permanent opening in the membrana tympani or that the cut edges or new cicatricial growth should be brought in contact with the stapes.

One other point to be considered in some of these cases of impaired mobility is the advisability, when an opening has been made through the membrana tympani, of passing a curved blunt knife upwards to divide the horizontal folds from before backwards, thus tending to free the ossicula by a procedure that is of undoubted advantage in some cases of suppurative trouble of the middle ear, where the drainage from above downward is hindered by such folds as were found in the following case of a healthy middle ear. The temporal bone was that of an adult male. The middle ear was opened from above only, by chiseling away the tegmen tympani, when under good illumination could be seen, in addition to the striæ in the neighborhood of the mastoid antrum, those reduplications of the mucous

membrane in the horizontal plane, one from the anterior wall above the tensor tympani extending downwards to the tendon of that muscle and entirely separating the upper from the lower portion of the tympanum anteriorly: another extending from the centre of the first backward and upward to the neck of the malleus, a small fold filling in a triangle formed by the tensor tympani, the inner tympanic wall and the head of the stapes, and, finally, a reduplication completely separating the upper from the lower portion of the tympanum in its posterior half, with exception of an opening between the descending process of the incus and the malleus, the position in which it is most commonly found in cases of excessive persistence of the horizontal folds, though often this one opening which permits drainage from above downward is so small as to be easily closed by swelling of the mucous membrane.

Dr. Randall: — It may not be inappropriate to remark that I have in one case attempted excision of the ossicles where the tinnitus was distressing. It was a sclerotic case. I had been asked by the patient to operate if there were any operative procedure that could do good. I at first declined, but in view of the favorable reports and of the fact that I had had a little experience with excision, I operated last spring, excising the drum-membrane and the malleus. I could not see the articulation of the stapes with the incus and I therefore did not disarticulate the incus, leaving that for a later measure if the first part of the operation proved unsuccessful. The membrane was merely indrawn and cicatrized. The result was practically nil. The recovery was satisfactory and the hearing is no worse. The distress is less than it was; but as to any real relief, the operation was practically of no value. I shall probably later disarticulate the incus and free the stapes from any adhesions. The removal of the drum-membrane and malleus has practically been of no benefit.

Dr. Theobald: — I have nothing to add to what has been said. I have had no experience myself with removal of the ossicles and the tympanal membrane. In listening to the interesting remarks of Dr. Blake, the question has arisen in my mind, Suppose we cut these adhesions and horizontal folds and ossicular tendons, as described, would we be at all sure that the parts we had divided should not quickly grow together again. It seems to me that the cut edges lying together would almost surely unite, producing the former condition. My own experience in this direction amounts to nothing. During the past winter I had a case of old sclerotic middle ear catarrh, in which the patient was extremely deaf and had annoying tinnitus. It occurred to me that if I could cut away the drum-membrane without removal of the ossicles, and by the introduction of an artificial drum-membrane, bring about a softening and alteration in the lining membrane of the tympanal cavity, I might improve the hearing and lessen the tinnitus. I therefore removed a considerable portion of the membrane and repeated the operation so that not more than one-third of it was left. I found the mucous membrane of the tympanal cavity atrophied, hard and dry. I introduced an artificial drum-membrane, which was followed by slight discharge, and the lining of the tympanum became moist and assumed the appearance of mucous membrane. The tinnitus, however, was not lessened, and there was no appreciable improvement in the hearing. The tympanal membrane constantly tended to reproduce itself. The patient passed from under observation and I have no doubt that the membrane finally was entirely reformed.

Dr. Blake: — In the majority of the examinations recently made by Dr. Bryant he has chiseled the tympanic cavity open from below as well as from above and has therefore been able to study these folds more thoroughly and the bearing which the description of some of his cases

has upon Dr. Randall's communication upon perforation of the membrane of Shrapnell is evident upon perusal. In the event of retention of pus in the upper portion of the cavity of the tympanum inclination of the plane of the mucous folds towards the upper surface of the short process favors its escape through the membrane of Shrapnell. The presence of these reduplications favoring the retention of pus would necessarily further a carious process in the head of the malleus or incus.

In reference to the second subject for discussion, — the removal of the malleus and incus in cases of suppurative trouble in the middle ear: if the bones themselves are implicated there can be but one rule and that is the common sense surgical rule that, given a bony cavity with dead bone the latter should be removed, so far as is safely possible, and drainage and cleanliness secured. Under these circumstances, where there is a large opening in the membrana tympani, where the suppurative process is in progress and the bones are diseased, the removal of the malleus and incus does not deserve to be designated as a very special operation. It is simply something that is necessary to the course of a successful treatment, but it should always be done carefully, without violence, and with due regard to the existence of caries in the walls of the tympanum also. In these cases the incus is often the more difficult of the two to deal with, as it is apt to be pushed up out of the way, where, if it cannot be grasped with a hook, it can often be caught with a wire snare.

A case recently operated on illustrates the importance of removal of a carious ossicle. It was that of a young woman with long continued suppurative trouble in the middle ear, the drum-membrane gone and granulation tissue filling the upper portion of the cavity. The malleus remained in position but the incus had sloughed away. Under continued treatment with the middle ear syringe

she was doing well, but was obliged to omit this when she passed under the care of another practitioner for the treatment of a uterine trouble. Shortly afterwards I was called on account of further development of the ear disease and found that she was beginning to have meningeal symptoms in connection with marked tenderness and slight puffiness behind the ear. Under ether a sufficiently free incision was made behind the ear to permit thorough search over the mastoid surface for any diseased spot in the bone. Such a point was finally found by means of a very fine probe and the sinus was traced from a point above the upper border of the osseous canal downward and inward until it entered the mastoid cells: with an eighth of an inch drill an opening was then made near the tip of the mastoid and carried in such direction as to meet the small probe passed into the sinus: this opening was then enlarged with the chisel and gouge as far as the small sinus and above it, and the cavity was thoroughly syringed out. Before the operation, while the patient was under ether, the upper portion of the tympanic cavity was thoroughly examined to determine whether there was any carious process about the head of the malleus. Everything was apparently smooth and it was supposed that the bad odor of the discharge came from the carious process in the antrum subsequently reached. The patient made a good recovery and everything went on well and nothing remained but a slight discharge from the upper portion of the tympanic cavity, which still had a very disagreeable odor. To get rid of this odor the ear was repeatedly cleansed by means of the middle ear syringe with weak solutions of permanganate of potash and examination of the tympanic attic was made from time to time: finally a small rough spot on the head of the malleus was detected. The patient was then etherized and the malleus removed, the steps of the operation being, first, division of the anterior

and posterior ligaments by means of a paracentesis needle, and of the external ligaments and folds by a curved spatula-like knife, and, second, the extraction of the malleus by means of a wire snare passed above the short process of the bone. No unpleasant symptoms supervened. The soft parts in the upper portion of the tympanic cavity became much swollen, but this disappeared in three days, as also did an uncomfortable sensation in the tip of the tongue on that side. The use of the middle ear syringe was continued and the discharge ceased in two weeks. Examination of the malleus showed the lower portion of the bone intact but carious above the neck and about its articulating facet.

In reference to operations about the stapes in cases where immobility is the result of suppurative trouble in the middle ear, the division of adhesions and tenotomy of the stapedius is perfectly justifiable, experience having shown that in old chronic suppurative trouble in the middle ear where the parts have become dry and hard, as well as where secretion still pertains, it is possible under antisepsis to operate with very little danger and, in some of them, with improvement from division of the adhesions and cicatrices. In a case of this sort referred by Professor Politzer and accompanied by suggestions and drawings which he kindly sent, there had been destruction of the posterior portion of the membrana tympani, exposing the tip of the descending process of the incus and the head of the stapes, and would have exposed the membrane of the round window but that the latter was bridged over by a thin but dense cicatrix which, it would seem, made a closed chamber of the vicinity of the round window. There was adhesion also to a cicatrix tying down the head of the stapes. Under the directions sent by Professor Politzer, the adhesions about the stapes were divided and the hearing carefully tested but without evidence of improvement. (The patient was very deaf, and was obliged to use a

conversation tube.) The thin membrane stretching across the neighborhood of the fenestra rotunda was then divided and the hearing immediately improved. The after result of the operation, however, answers Dr. Theobald's query, in reference to permanent results in many of these cases, notwithstanding an earnest endeavor on the part of the patient to maintain the mobility of the parts. In two weeks the hearing had again decreased and the operation had to be repeated. This was done four times in the tissues about the round window, and the division in the neighborhood of the stapes twice, and yet the hearing is but little, if at all, better than before the first operation, six months ago.

Another case of this same class, but one in which there was already existing suppuration, gave better results. There the patient permitted treatment with the view of mobilization of the ossicles with the intent of using a vaseline cotton drum. The membrana tympani had been destroyed and the tip of the malleus was adherent to the promontory and there were adhesions about the stapes. The operation consisted, first, in cutting the tip of the malleus away from the promontory and dividing the tendon of the tensor tympani. There was no improvement in hearing on testing with the cotton drum. The incudo-stapedial articulation was then divided, but also without improvement, until finally after division of the tendon of the stapedius and of adhesions in the niche the patient could hear better with the artificial drum. The improvement in this case has continued now for nearly a year.

The division of adhesions, about the ossicles, resulting from suppurative trouble in the middle ear, with reference to improvement in hearing, either with or without the artificial drum, is certainly an advisable operative procedure, but the possible drawback which Dr. Theobald has mentioned should always be remembered.

Dr. Rider: — I should like to ask Dr. Blake one

question. I understand him to say that in suppurative inflammation of the middle ear, he would not under any circumstances remove the ossicles or any one of the ossicles, unless he was satisfied that that bone was itself diseased. Is that correct?

DR. BLAKE: — Yes, or to get access to other carious bone or to favor drainage.

DR. RANDALL: — Dr. Richards has left with me some beautiful glass canulas for syringing these cases of attic trouble and I should like to submit them to the examination of the Society. [Canulas exhibited.]

In connection with the point of Dr. Rider, I would state that in the cases I have referred to, a carious condition of the neck of the malleus was distinctly discovered in a number of them. In twelve or fifteen cases out of twenty-five that I saw myself I touched bone that was bare upon the neck of the malleus: yet a number of these cases showed fairly prompt healing and some of them I am certain have suffered no recurrence. We must regard the presence of a limited amount of caries as an insufficient cause for the removal of any of the ossicles. There are some cases where the operation is absolutely necessary; but in many of these cases caries of the malleus can heal. Unless there be considerable caries of the ossicles and the Rivinian segment the case may do well under mild measures, such as syringing and boric acid powder.

DR. HOWE: — What does Dr. Blake regard as the diagnostic signs of such a carious condition as he has mentioned, especially when it is limited to the articulating surface of the malleus?

DR. BLAKE: — In the case reported, the incus had disappeared and the articulating surface could be directly examined. In these cases the ordinary surgical rules are a sufficient guidance. Carious bone should be removed to get rid of the irritation which is helping to keep up the sup-

purative process. In all these examinations for caries of and around the ossicula it is necessary to use very fine and rounded probes, preferably those with the olive tip. With these it is possible to get fairly good touch and determine the presence of roughened bone. Another procedure sometimes of advantage is the use of a probe somewhat like that of Dr. Noyes, having a smooth instead of a screw tip. By means of a small rubber tube slipped over the handle of the probe and passing to the ear of the examiner, the sense of hearing may be used to supplement the sense of touch.

I should not be willing to undertake the removal of the malleus and incus in suppurative trouble in the middle ear until other means for cleansing the cavity and for doing away with the granulations and stopping the discharge had been pretty definitely tried.

Dr. Theobald: — As bearing upon the point brought out by Dr. Randall, that there may be caries of the ossicles without the necessity for their removal, I may say that in my experience in the treatment of strictures of the nasal duct it is common to find caries of the small bones constituting the walls of the lachrymal duct. During the treatment by the passage of probes the caries disappears and the canal and sac get perfectly well, and I have never in a single instance found it necessary, with a sharp spoon or other cutting instrument, to attempt the removal of any portion of the diseased bone. Almost without exception these cases recover entirely and ultimately. When the probe is passed, it encounters a smooth healthy surface instead of the rough exposed bone which was felt at the beginning of the treatment. The vascularity of the parts favors this reparative process.

The President: — I think that the majority of the gentlemen present will agree with Dr. Theobald that the presence of carious bone does by no means indicate the necessity for its removal.

FOUR CASES OF MASTOID CELL DISEASE CURED BY WILDE'S INCISION AND PROPER ANTISEPTIC TREATMENT.

By Oren D. Pomeroy, M. D., *New York, N. Y.*

Case I.—A mastoid abscess in a woman 49 years of age with a fistula three-fourths of an inch deep, which healed without operation upon the bone.

Matilda Y., æt. 49, has a chronic suppurative middle ear affection in her right ear.

At the age of eleven she had scarlet fever, which was followed by permanent lowering of the hearing of her right ear; there was no discharge. In the first of January last she had an attack of the grip, complicated with pneumonia, which was soon followed by a somewhat violent attack of suppurative otitis in the right ear. This was treated in the usual manner for about ten days, when an abscess formed over the mastoid region. This was freely incised on the first of March, 1890. There was much swelling, and only a small amount of pus was evacuated. The patient was anæmic and much depressed, and inclined to suffer more pain than the gravity of her affection called for; she has an anxious expression of countenance, as though more was ailing her than seemed apparent. A fistulous opening was discovered a few days after the Wilde's incision, entering the mastoid at a point slightly above the level of the meatus and extending forwards and upwards to the extent of three-quarters of an inch, the probe touching a softish substance at the bottom, pre-

sumably granulations. These were broken up by the probe and some bleeding resulted.

The treatment consisted of tonics, stimulants, and careful attention to nutrition, cleansing the wound with bichloride solution, keeping the wound open with a gum elastic catheter as a drainage tube, and at other times the iodoform gauze for the same purpose. Granulations about the wound were removed in the usual manner.

Her temperature much of the time was slightly above the normal, but was never higher than 100° F., so little attention was paid to it.

I concluded on May 7th, about seven weeks after entering the hospital, that the wound behind the ear and the fistula would remain open as long as we continued the use of the drainage tubes and iodoform gauze, and I directed to allow the wound to close. This was accomplished in one week, and the patient was discharged cured.

She has occasionally presented herself, and up to July, 1890, there has been no relapse. I am aware that I am liable to be criticized for allowing an external wound to close while a bone fistula is present. Naturally there is a lining to the fistula walls composed of minute particles of carious bone which must be disposed of before separation takes place; likewise there is a certain amount of danger of absorption of septic material. It is undoubted that in these cases there was no harm from whatever absorption of septic matter occurred, and that this absorption paved the way for reparation.

I would by no means offer to others any encouragement to violate established surgical rules, but in the cases here recorded I believe I have acted according to well marked indications; if there had been any signs of blood poisoning, I admit the rule of action would have been changed.

Case II.—A case of mastoiditis with a fistula, cured by Wilde's incision, cleanliness, etc. Fistula closed before the external wound.

John A., æt. 39, eight weeks since, had an attack of the grip, which soon resulted in a violent attack of suppurative middle ear disease of the right, the pain from which kept him from sleeping for one week. Dr. Kirkendall, of Ithica, punctured the membrane with instantaneous relief to the pain. No pain since to date (March 19, 1890). The ear discharges profusely. Two days previously he noticed a swelling on the mastoid with great tenderness. There is a large perforation of the drum-membrane at its anterior inferior quadrant; canal red and swollen. Swelling on mastoid had been blistered previous to coming into the hospital.

On March 20th the swelling on the mastoid was divided to the bone by a Wilde's incision, giving exit to a ʒi of pus; poultice applied. In a day or two discharge from the ear very much diminished.

After about a week a fistulous opening in the mastoid extending in the direction of the antrum for about eleven-sixteenths of an inch was discovered. This did not communicate with the tympanum. The treatment through most of the attack consisted of irrigation with the bichloride solution, keeping the wound open with iodoform gauze, cleanliness of the tympanum, etc. After about two weeks the membrane had healed and the discharge was completely arrested.

The fistulous opening gradually grew more shallow until its complete obliteration, when the external wound was allowed to close. The duration of the treatment was about twenty days.

The patient was from the country and in good general condition on entering the hospital. The pulse and temper-

ature never once deviated from the normal. In this case there seems no question of the advisability of doing otherwise than what was done.

Case III.—A mastoid abscess in a child four months of age, with a fistulous opening, which healed with only a Wilde's incision.

James L., æt. 4 months, had a mastoid abscess behind the right ear. There had been a discharge from the ear during the last two weeks accompanied by considerable pain. The mastoid swelling seemed to make its appearance somewhat suddenly after an apparent diminution of the otorrhœa.

The abscess was promptly opened and a large quantity of pus was evacuated. The outer table of the mastoid was carious and the knife easily entered the antrum. Bone roughened and apparently dead, for a considerable area about the opening into the antrum was observed. A probe was passed into a fistula extending forwards and inwards along the neighborhood of the tympanum, but to a depth of one inch and a half, touching solid bone, — a region in front and probably internal to the tympanic cavity.

The pain in the ear ceased after the completion of the incision, and the discharge rapidly grew less.

The treatment throughout consisted in daily irrigation of the parts with the bichloride solution. The wound was kept open by the insertion of iodoform gauze. Frequent probing was done to observe the condition of the fistula, great care being taken to wash it out and prevent infection. Granulations frequently sprang up about the incision but were removed by the thumb nail with subsequent cauterization. The child never showed any special systemic disturbance.

This fistulous opening gradually grew shallower until

after about two months it had completely healed, when the external wound was allowed to close. The discharge from the ear had ceased and the drum-membrane was healed long before the fistulous opening had closed. It was never demonstrated that the fistula passed across the tympanum.

The child's health was carefully looked after as an important indication to be fulfilled.

In this case I suppose no surgeon, however bold, would have ventured to open this fistula. It was at least fortunate that reparative action resulted so promptly.

The age of the patient (4 months) is worthy of note, it being rare to find so extensive lesions in one so young.

Case IV.—A mastoid abscess with a carious opening into the cells. Slightly enlarged by a probe, cured by Wilde's incision and antiseptics.

Otto S., æt. 22, a diver by occupation, applied to the hospital for treatment on April 30, 1890.

Since March 17th, has had symptoms of an acute otitis media.

The ear was poulticed for four days, when profuse discharge appeared, which resulted in relief to the pain until April 11th, when it again returned and continued until his admission to the hospital. It was then noticed that he had great tenderness over the mastoid region, which was red, hot, and swollen so as to extend downward well along the sterno-cleido-mastoideus muscle.

Wilde's incision was done in the usual manner under ether. Pus discharged; bone found rough and somewhat carious. By using a probe an opening was found near the apex of the mastoid. This was enlarged slightly, but no pus was found. The wound was dressed with iodoform gauze, covered with moist bichloride dressing, the whole

enclosed in a bandage. This dressing was removed from time to time to admit of irrigation with hot water and antiseptic washes (bichloride).

May 2d, balsam Peru dressing applied; no pain; patient in good condition. Balsam Peru dressing continued, and on May 8th was so far convalescent as to leave the hospital. This case does not seem to be of great importance, and it seems evident enough that reparation had taken place without any especial attention to the broken down mastoid.

To Dr. Franklin Soper of my staff I am indebted for the presentation of this case.

DISCUSSION.

Dr. Andrews: — I was struck by a remark made by Dr. Pomeroy in justification of the course which he pursued in the first case, namely, that if there had been blood poisoning he would have pursued a different course. Would he wait for these alarming symptoms? I believe that most otologists would agree with me, that where there is carious bone in the class of cases under discussion, it should be removed.

Dr. Pomeroy: — I think that we all agree that if there is any septic material in the body liable to absorption, the patient is in danger, but the danger is so nearly infinitesimal where the extent of the disease is so limited that I do not feel frightened at its possible occurrence. I think that Dr. Andrews' point is well taken. I should not like to wait without operating until serious signs of septicæmic disturbance appear. There are many cases where there is carious bone and septic material in small amounts without danger of blood poisoning. In nasal disease we have all seen cases where the probe touched dead bone. We could not say that septic matter would not be absorbed and

kill the patient, but this has never occurred in any case so far as I know.

Dr. Abbott: — I should like to relate a case of recovery from mastoid disease without operation. In February or March a physician brought a patient to me for consultation. The history was that for three months he had been in a pitiable condition with great swelling over the mastoid and very severe pain, which was relieved only by large doses of morphine. The doctor recognized the presence of pus, but the patient refused to have the abscess opened. Finally the physician plunged a knife into it when the patient was off his guard. When he came to me there was great swelling over and about the mastoid with an opening perhaps a quarter of an inch long over the tip, through which pus streamed upon pressure for two inches on either side of it. The probe passed readily into the mastoid.

I said that it would have to be opened and the carious bone removed, but as soon as the operation was suggested, the patient left the office. About June 10th I happened to see the patient again. The mastoid was the seat of dense depressed cicatricial tissue, its external shell evidently gone. There was a slight otorrhœa but all traces of mastoid disease excepting the cicatricial tissue had disappeared. He had never had anything done to the mastoid, but his physician had established drainage in the abscess and syringed it out with peroxide of hydrogen.

Dr. Richards: — The cases of Dr. Pomeroy strike me as those of spontaneous perforation from within. There, the pus escapes readily and has escaped usually without encountering any particular resistance, and hence escapes early. The accumulation has not taken place in the inner parts of the bone and there is sufficient opening for the escape of the pus. I think that the rapid healing in these cases illustrates a point I have noticed and that is, that the

apparatus which we use to keep open the wound often acts as a cork to close it up. I do not know of any form of drainage in common use that may not keep in as much discharge as it allows to escape. If there be any material that is free from this objection, I think that it is horse hair. With this the pus can get into the drain at any point throughout its length. I have seen healing of a wound quickly follow the removal of drainage apparatus, even when there was considerable roughened bone left. In one case there was a large area of bare and blackened bone. After treating the case for a week or more to maintain an opening opposite this area I left it alone and it healed up, and there was no more trouble. I have seen cases which had been operated on one or two months before and where careful dressings had been maintained to keep the wound open. These cases would have had a much better chance if they had been rather more neglected, so to speak. Although it may, and often does, prove safe to trust to nature's drainage where one finds a spontaneous perforation of the bone, yet it is better practice to enlarge such an opening.

Dr. F. P. Capron: — I should like to cite a case which bears upon the subject under discussion. A young lady, seventeen or eighteen years of age, came to me with acute inflammation of the middle ear. A polypus had developed which was removed, but soon recurred. The pain increased and soon a swelling formed over the mastoid. I advised operation, to which a reluctant consent was given. She was taken into the hospital and operated upon. An enormous amount of fœtid pus was evacuated. The patient did not appear to be benefited for more than twenty-four hours. The temperature was 102° to 103°. It went up in the next five days from 102° to 105°. The patient was hardly herself at times and suffered intensely. She was kept under the influence of opiates and instead of enlarging the wound

and scraping out the bone, a poultice of flaxseed meal was applied and the opening was syringed so that the solution escaped through the external meatus. For the first ten days or two weeks, there was no difficulty in syringing. In two or three weeks the opening in the drumhead healed and upon syringing the water came out of the nostrils. The poultices were continued and the swelling extended down the sheath of the sterno-cleido-mastoid muscle and finally reached the level of the chin and drainage tubes were used as needed. After three weeks we began to apply compresses and in a few days the pus pockets closed up and the wound discharged less. The temperature fell. The patient had been kept on quinine, brandy, etc., with proper nourishment. She began to make good progress and in four or five weeks was sitting up. The drum-membrane again opened but subsequently healed. When I ceased finding any particular discharge of pus I used the syringe less frequently and finally it was stopped altogether. There was a little discharge from the external opening. Nothing was done, although there evidently was carious bone present. I saw the patient from time to time for six months. In the course of a month or six weeks the opening closed and a little swelling formed which was fluctuating. I passed a probe through and evacuated a little bloody matter. In a couple of months I did the same but eventually the opening firmly closed. I reported this case to the state society some years ago as an instance of severe inflammation of the mastoid cells which apparently would have warranted more vigorous operative measures than were adopted, but which under careful cleansing and the use of poultices recovered. This result might be attributed rather to good fortune, but I should treat another case in the same way even if such serious symptoms were present.

Dr. Reeve: — Because a bone is rough and bare it is

not necessarily dead and therefore material which should be treated as a foreign body. I have often met with cases in which a large surface of the mastoid process was rough and bare, with pus between the periosteum and the bone, and where prompt reunion occurred after evacuation by a free incision or possibly an opening into the mastoid cells primarily or by enlarging an existing sinus. I think that in such cases as have been reported by the President where prompt healing has occurred, although bare and rough bone has been allowed to remain, it does not necessarily follow that the bone was dead.

Dr. Blake: — The series of cases reported by Dr. Pomeroy is of much interest as illustrating among others that point mentioned in regard to bare bone: considering the blood supply of the mastoid, and remembering the cases that we have all seen of exposure of bone in young people where the bone has retained its vitality and been subsequently covered over, we must recognize the importance of using the chisel and gouge with discretion.

In connection with the cases of the President, I am sorry not to have at hand the notes of ten cases of mastoid disease, five of which serve to illustrate indirectly the point with reference to spontaneous recovery.

In five of the cases it was found advisable to continue syringing freely for from one to three weeks after the opening of the mastoid. The five cases in which this was not done were those in which there was considerable swelling of the mucous membrane of the tympanic cavity apparently sufficient to close or nearly close the mastoid antrum and render the forcible syringing after operation inadvisable: — cases in which, moreover, the amount of pus was very small and apparently localized in the mastoid. All five of these cases made a speedy and good recovery after operation. In three of them evidence was found of pus making its way through the outer mastoid wall.

Some search was required to find the sinus, but a small sinus was in each case found and an opening made sufficient to allow the pus to escape freely. These three cases out of the five in which no subsequent syringing was employed correspond with the cases reported by the President, in which there was spontaneous opening with good recovery without any very vigorous treatment.

CORRIGENDA.

On page 588, third line from bottom of page, for "left hand" read "upper."
On page 590, fourteenth line from top, for "bunch" read "band."
On page 601, last line, for "print" read "present."

ALPHABETICAL INDEX

OF

OTOLOGICAL LITERATURE, FROM JULY 1, 1889, TO JULY 1, 1890,

COMPILED BY

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